

**Genome, Epigenome, and Environment Determine the Set
of All Possible Motivated Behaviors.**

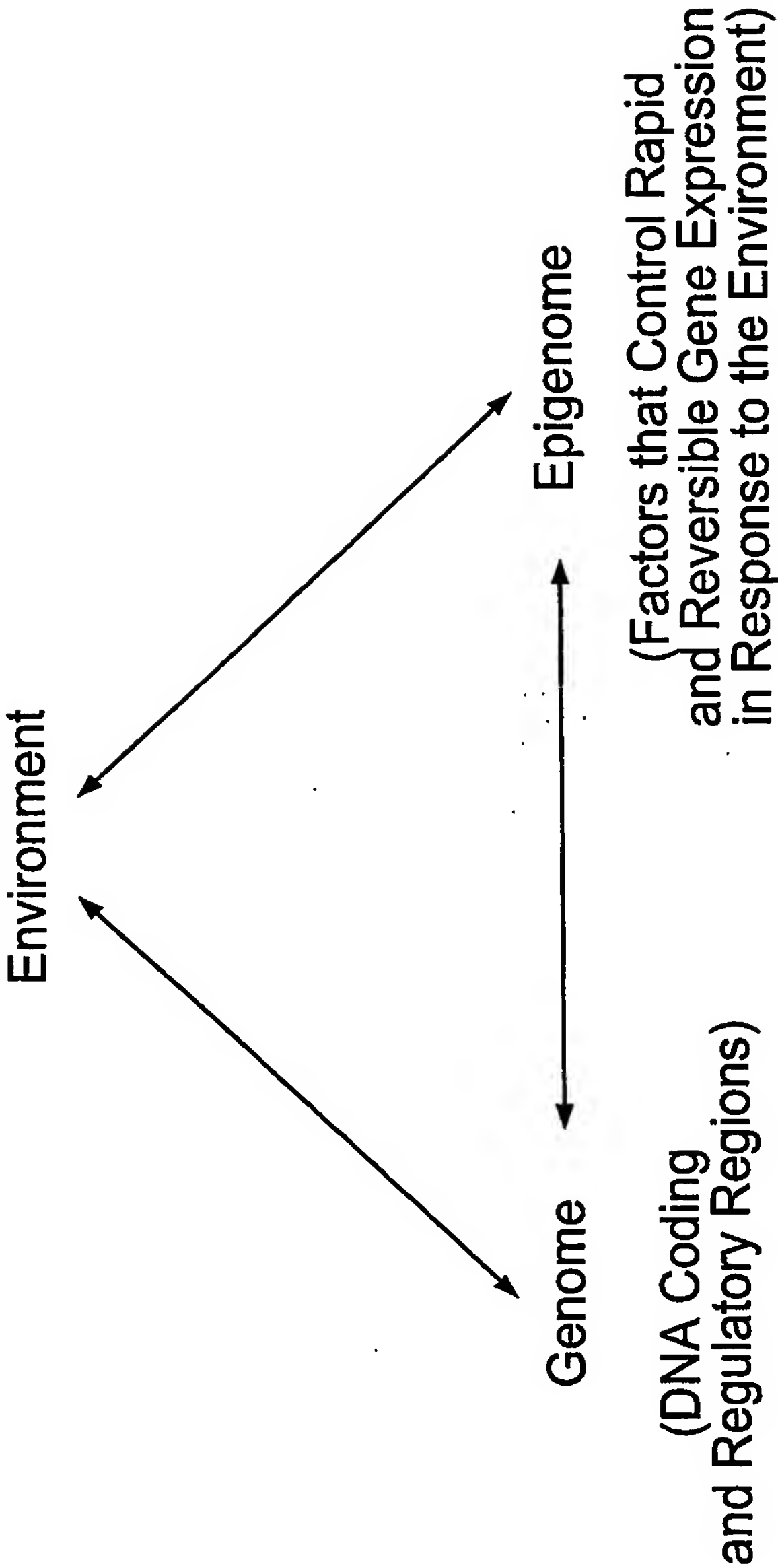


FIG. 1

**Systems Biology Acts as an Interface Between
the Environment and Genome/Epigenome.**

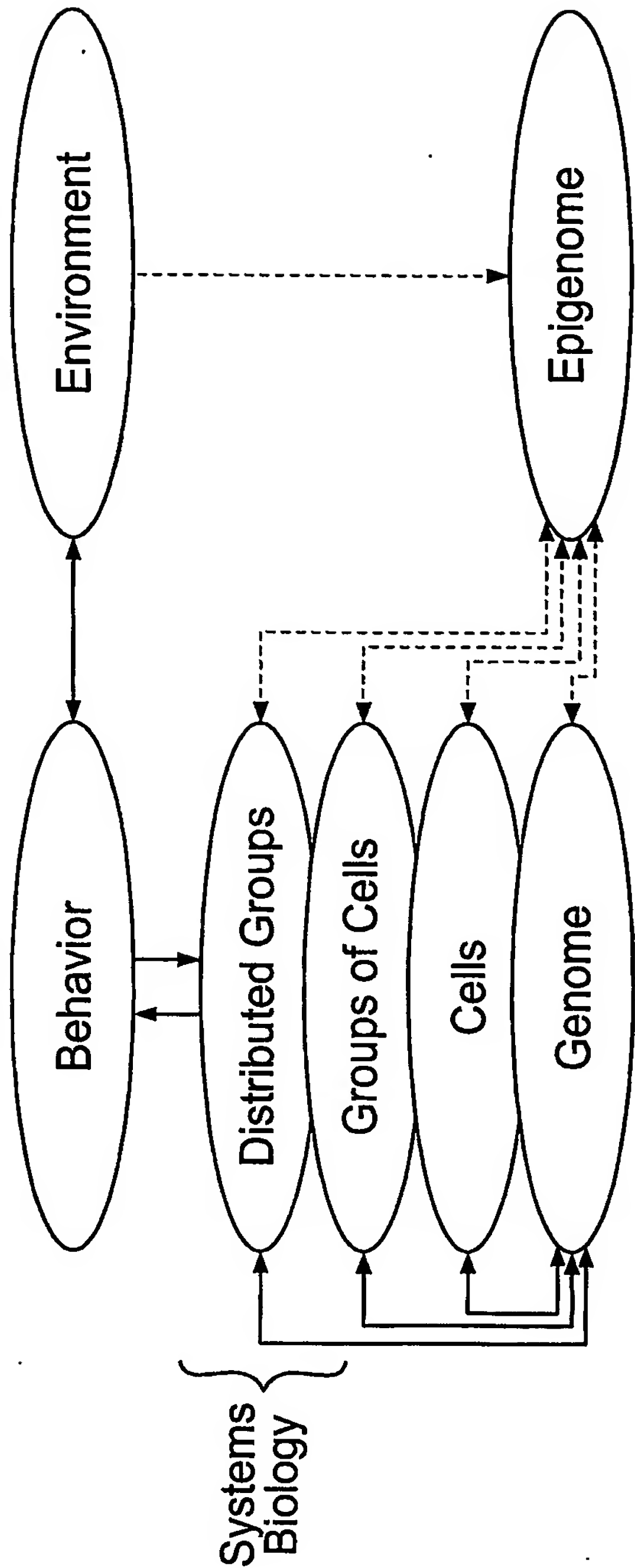


FIG. 2

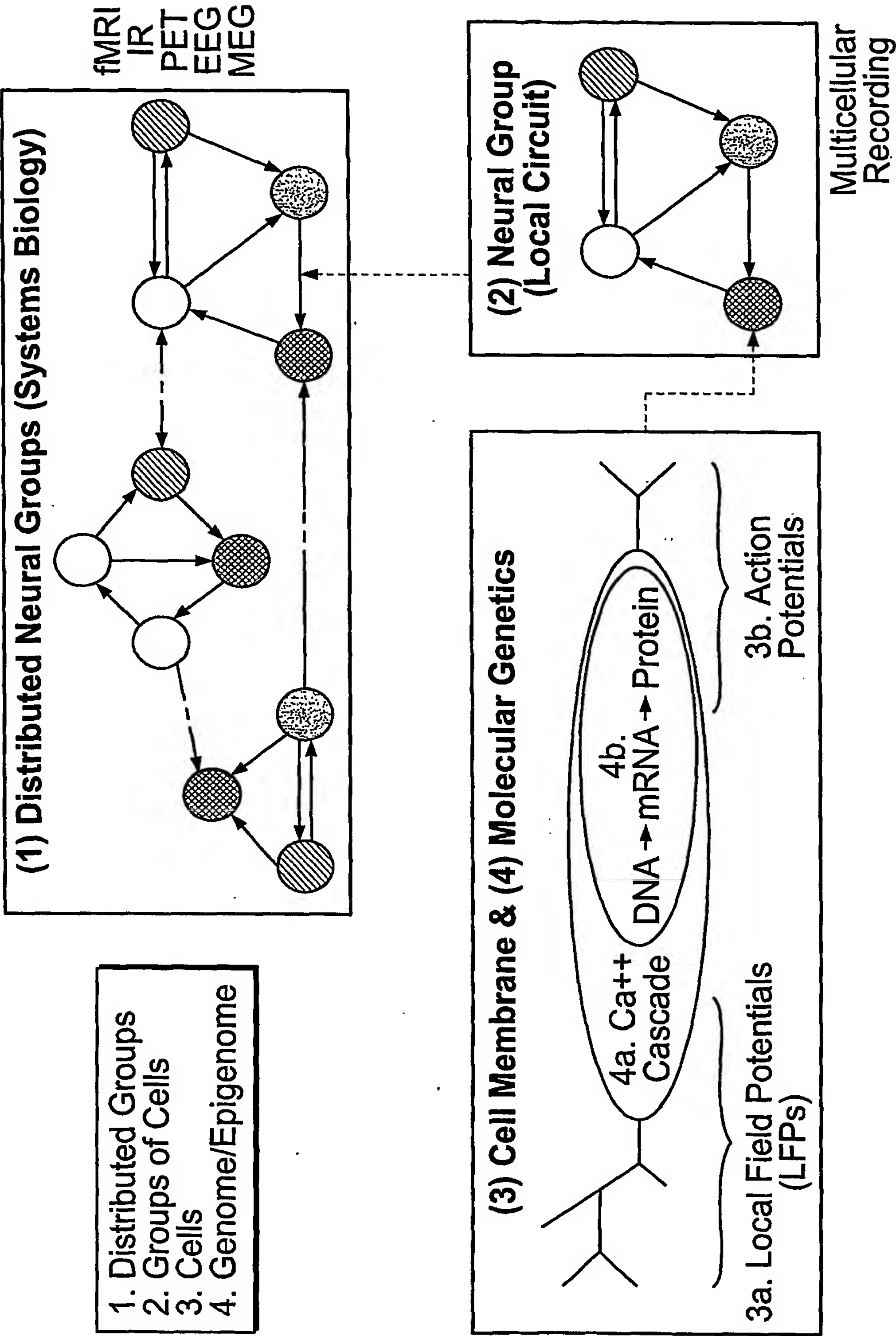


FIG. 3

Cognitive Physiology Model

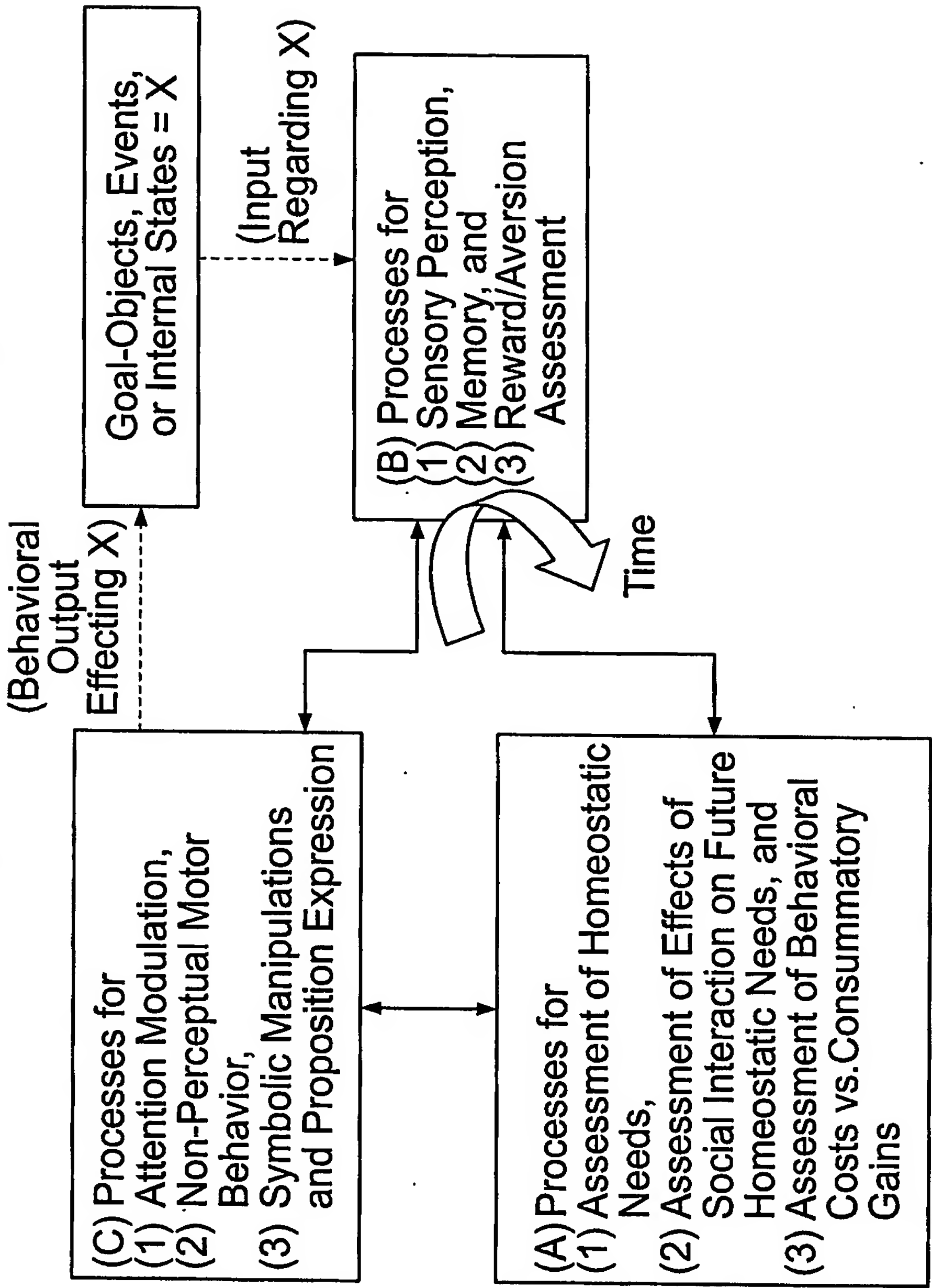


FIG. 4A

Communication Theory Model

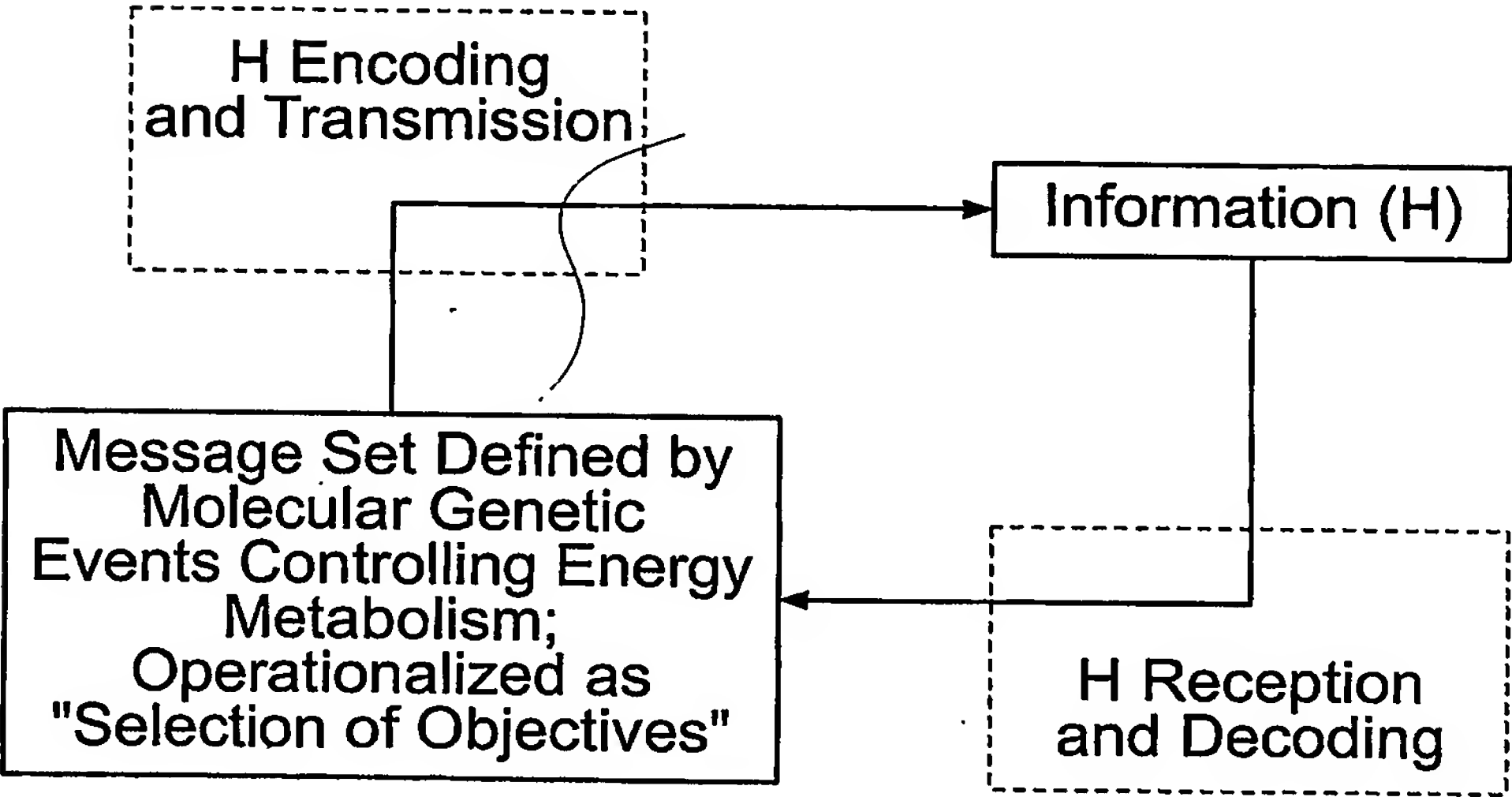


FIG. 4B

Combined Model

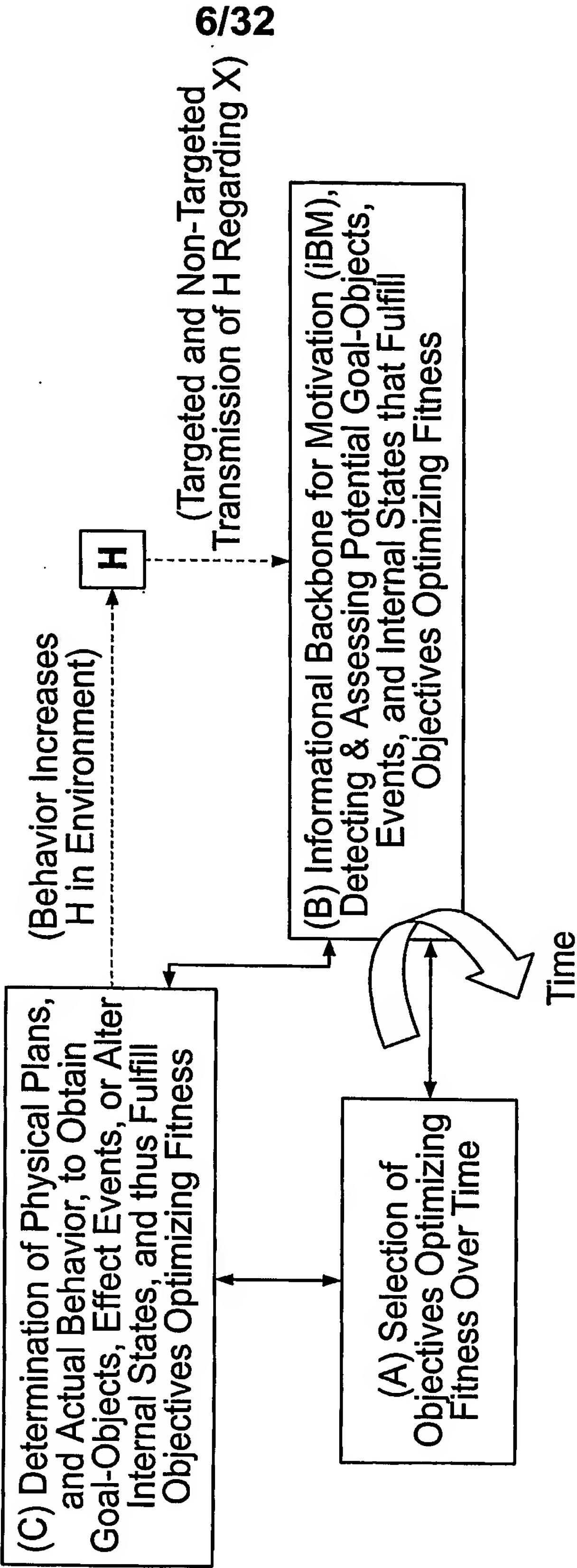


FIG. 4C

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The Informational Backbone for Motivation (IBM)

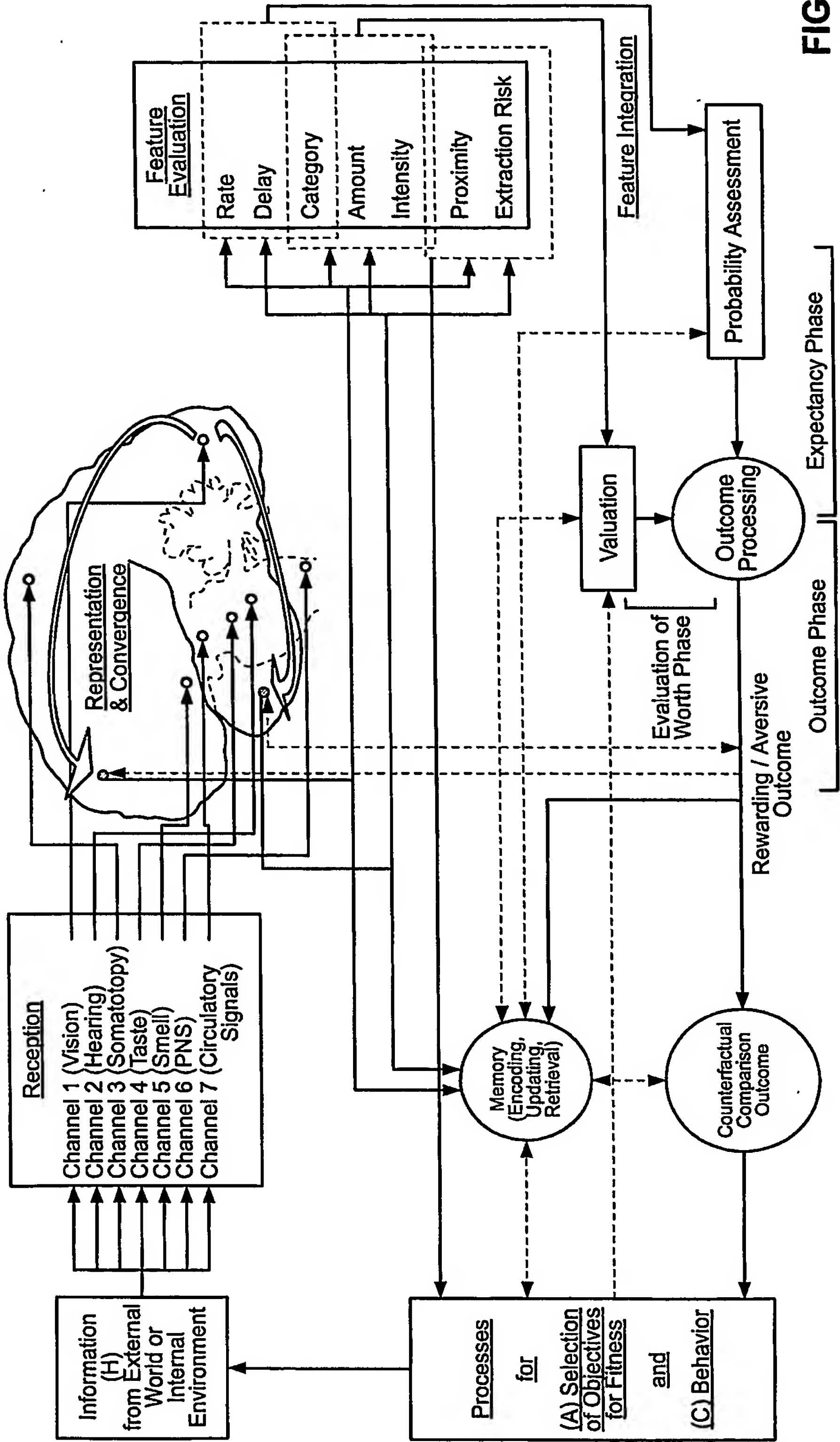


FIG. 5

Dissection of Combined Model
(a) Combined Model for Motivation:

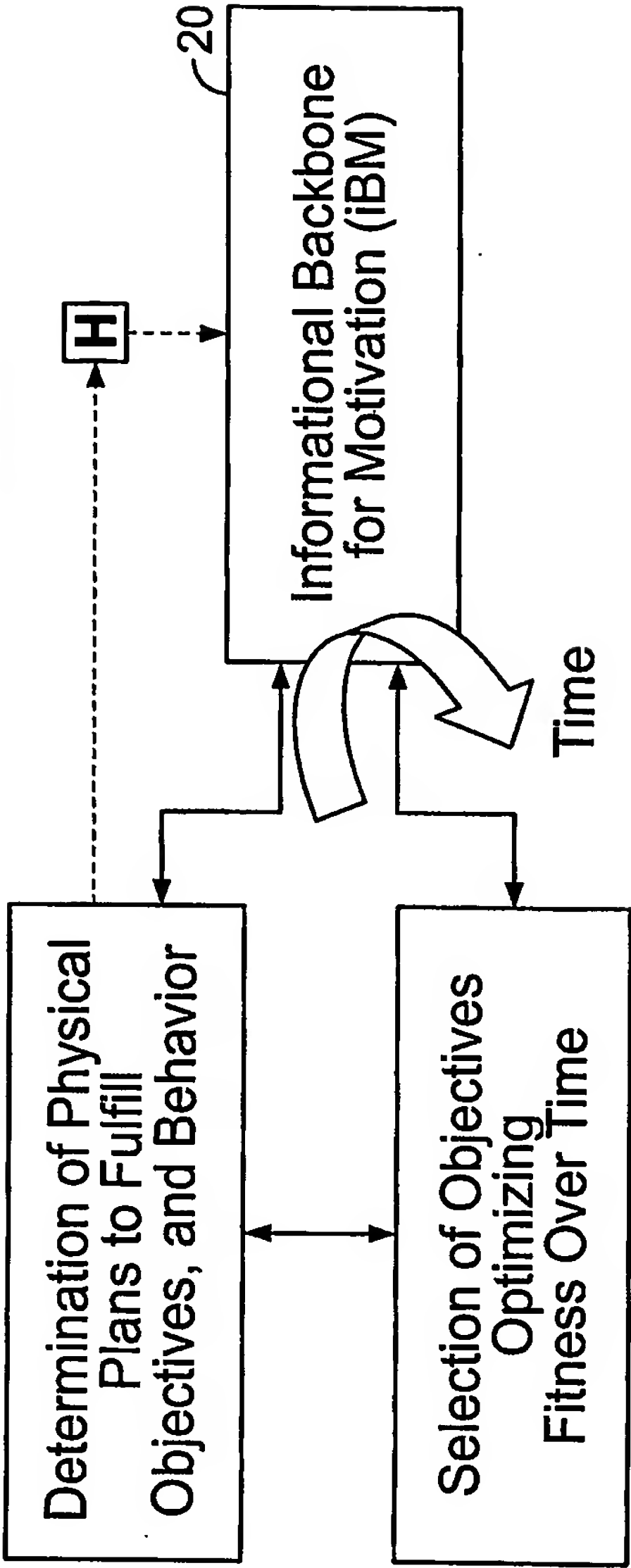


FIG. 6

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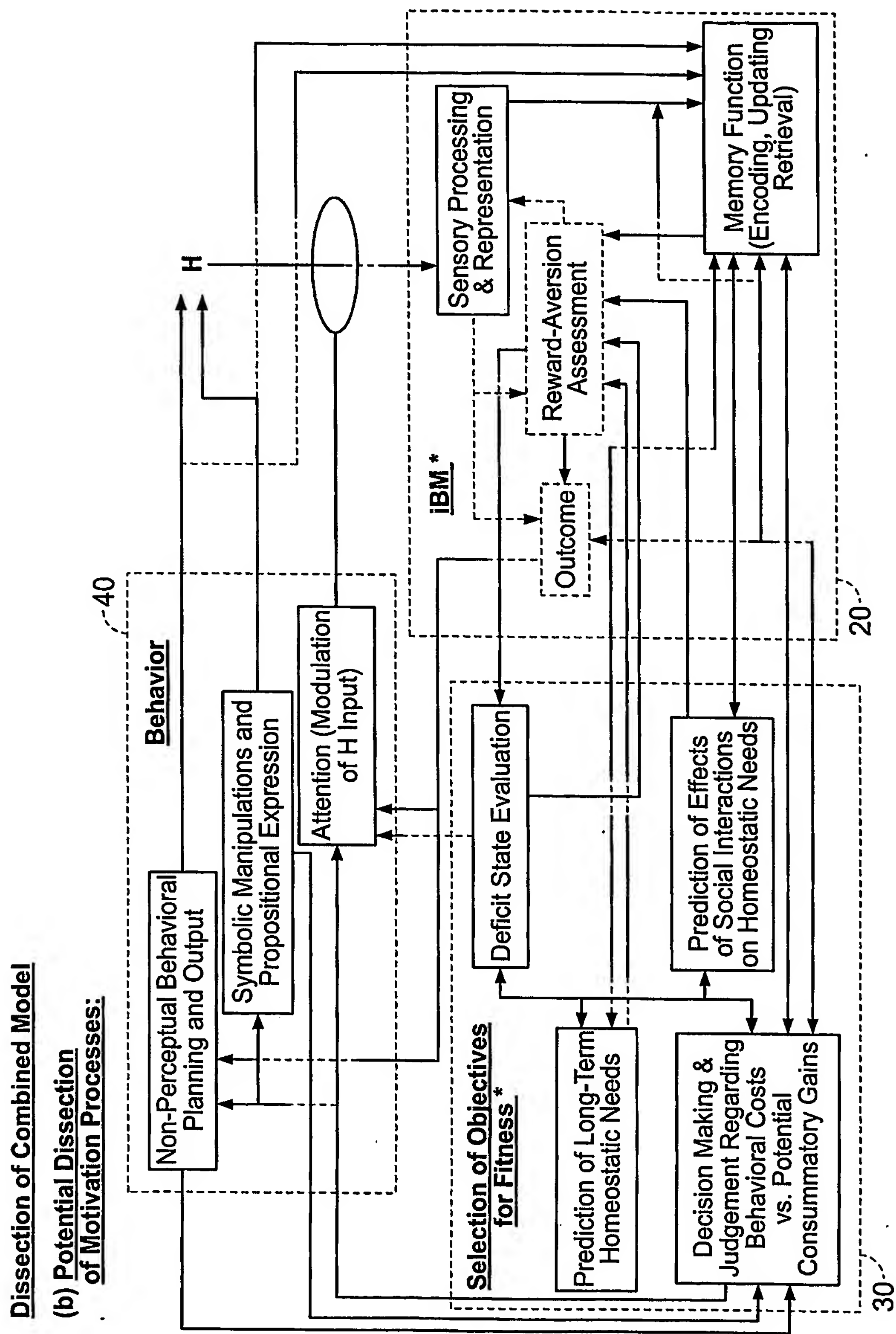
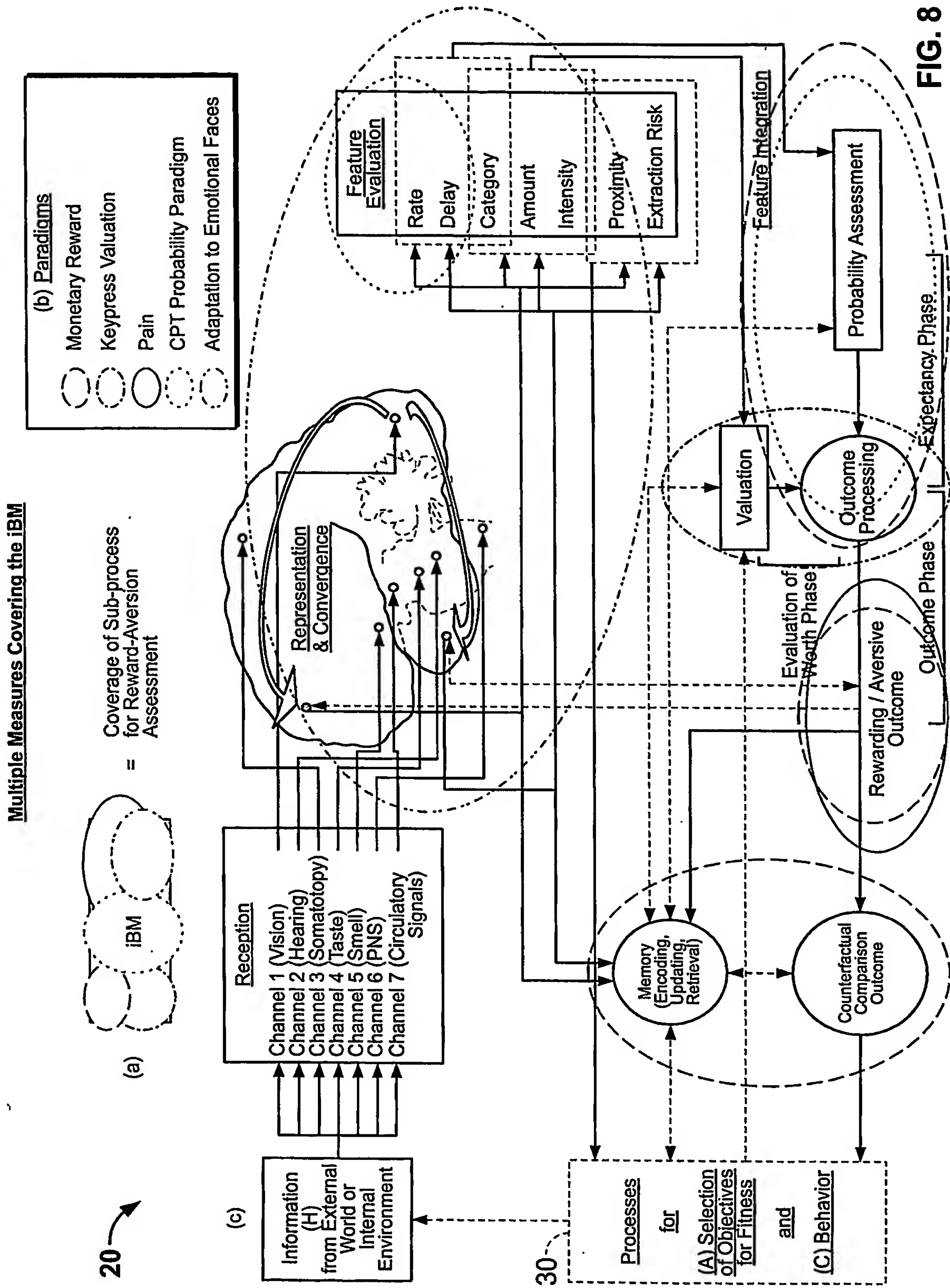


FIG. 7



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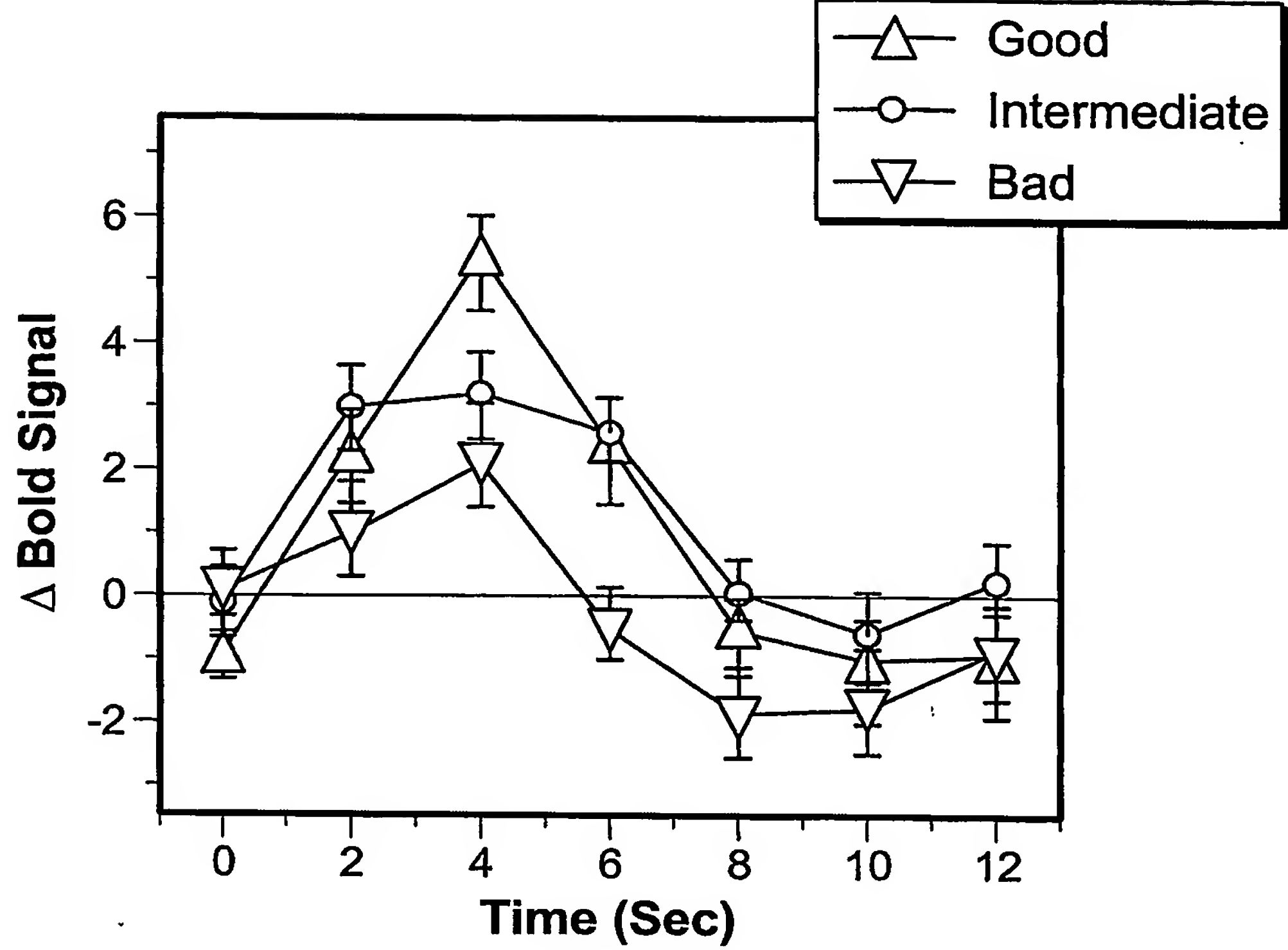


FIG. 9A

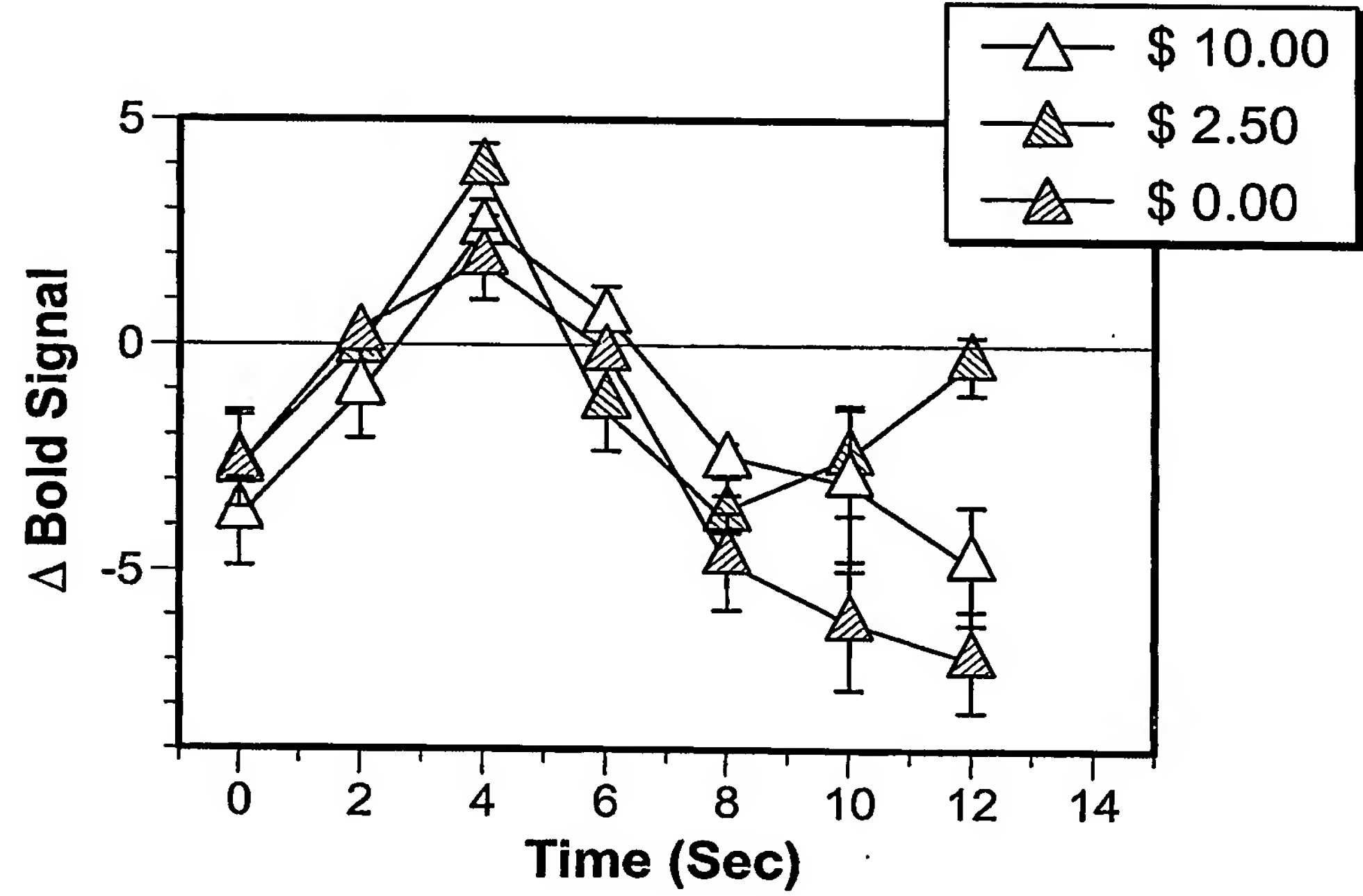


FIG. 9B

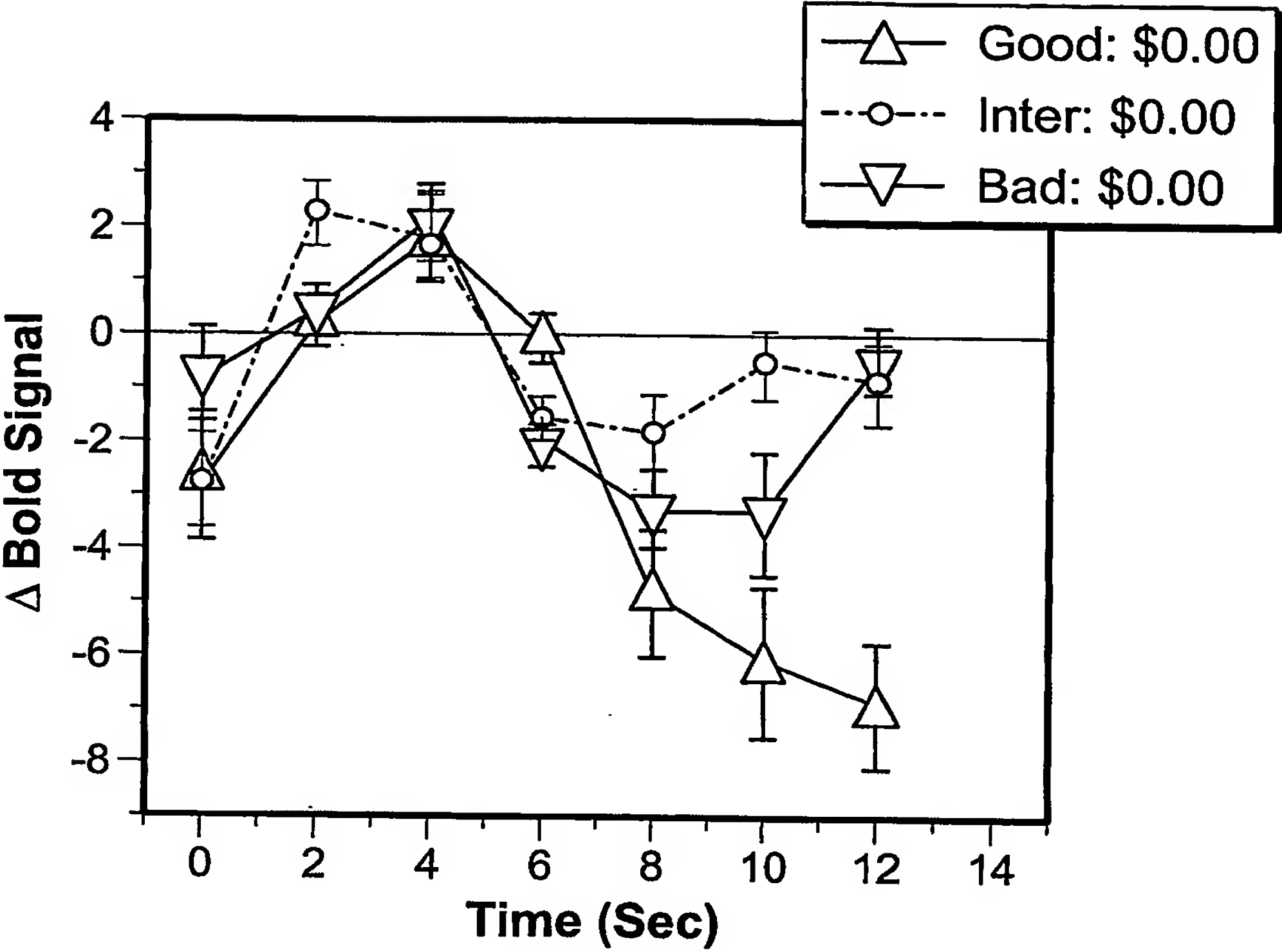


FIG. 9C

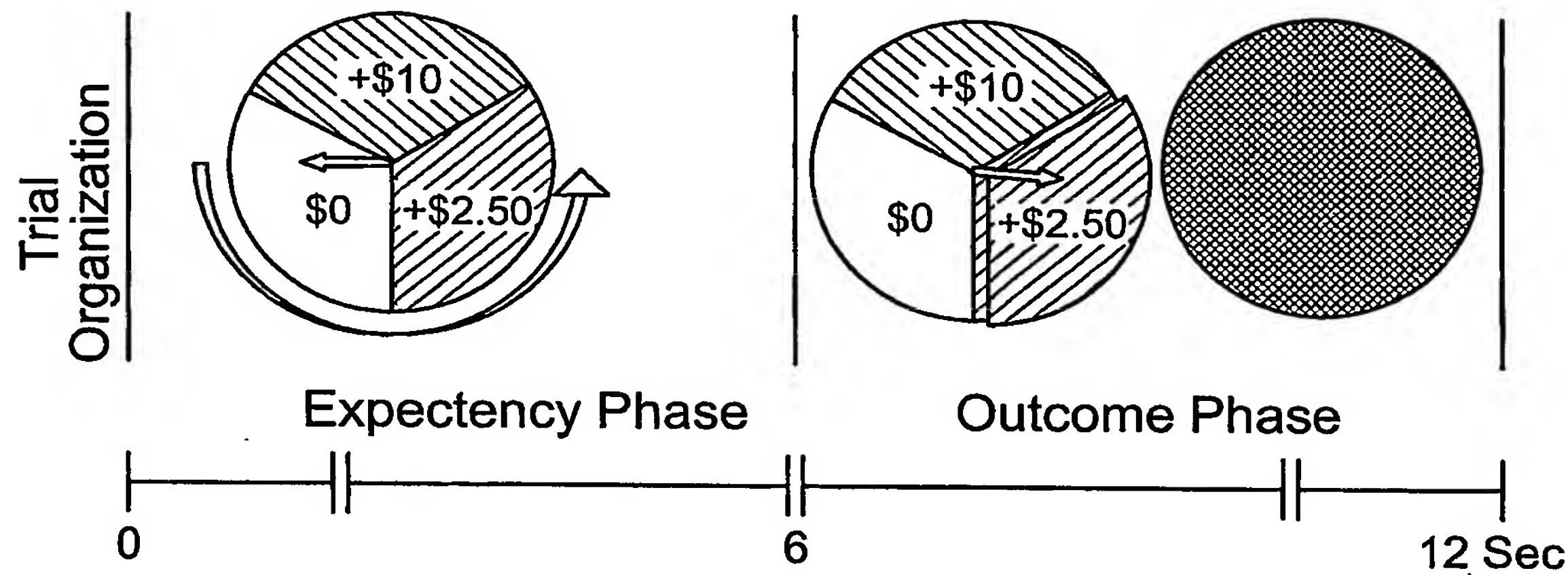


FIG. 9D

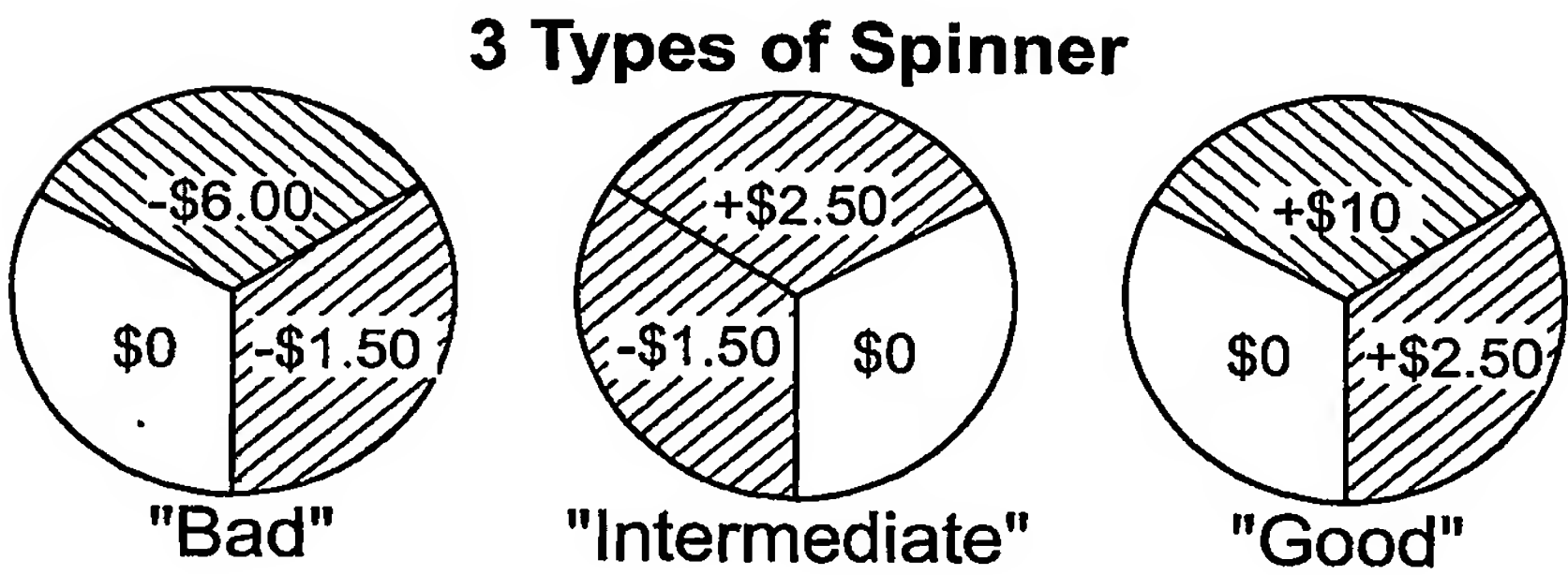
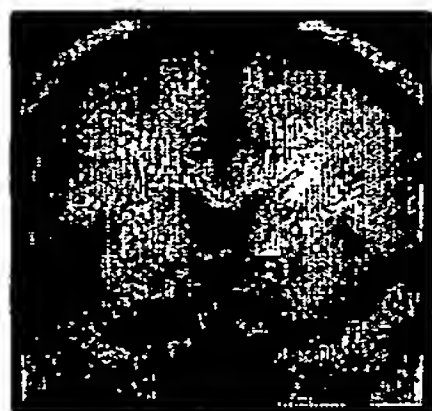


FIG. 9E

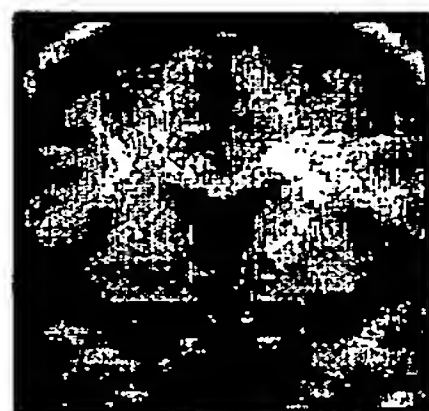
Expectancy				Outcomes				
Region	Cocaine	Monetary Reward	Region	Cocaine	Monetary Reward	Beauty	Pain	
GOB	R		GOB	(1) (2)		(+) (-)	(+) (-)	
	L			X X	X ³	(X ²)	X ²	
	R	X ²		X	X ³			
NAC	R	X	NAC	X X	X	X (X)	X X	
	L	X		X		X	X	
	R	X		(X) X	X	(X)	X	
SLEA	L		SLEA	X		X		
	R	X		X	X			
	L			(X) X	X	(X)		
Amygdala	R		Amygdala	X	X			
	L			(X) X	X	(X)	(X)	
	R	X		X	X			
VT	R		VT	X X	X			
	L			X X	X	(X) X	X X	

FIG. 10A

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Monetary
Expectancy



Cocaine
Expectancy

FIG. 10B

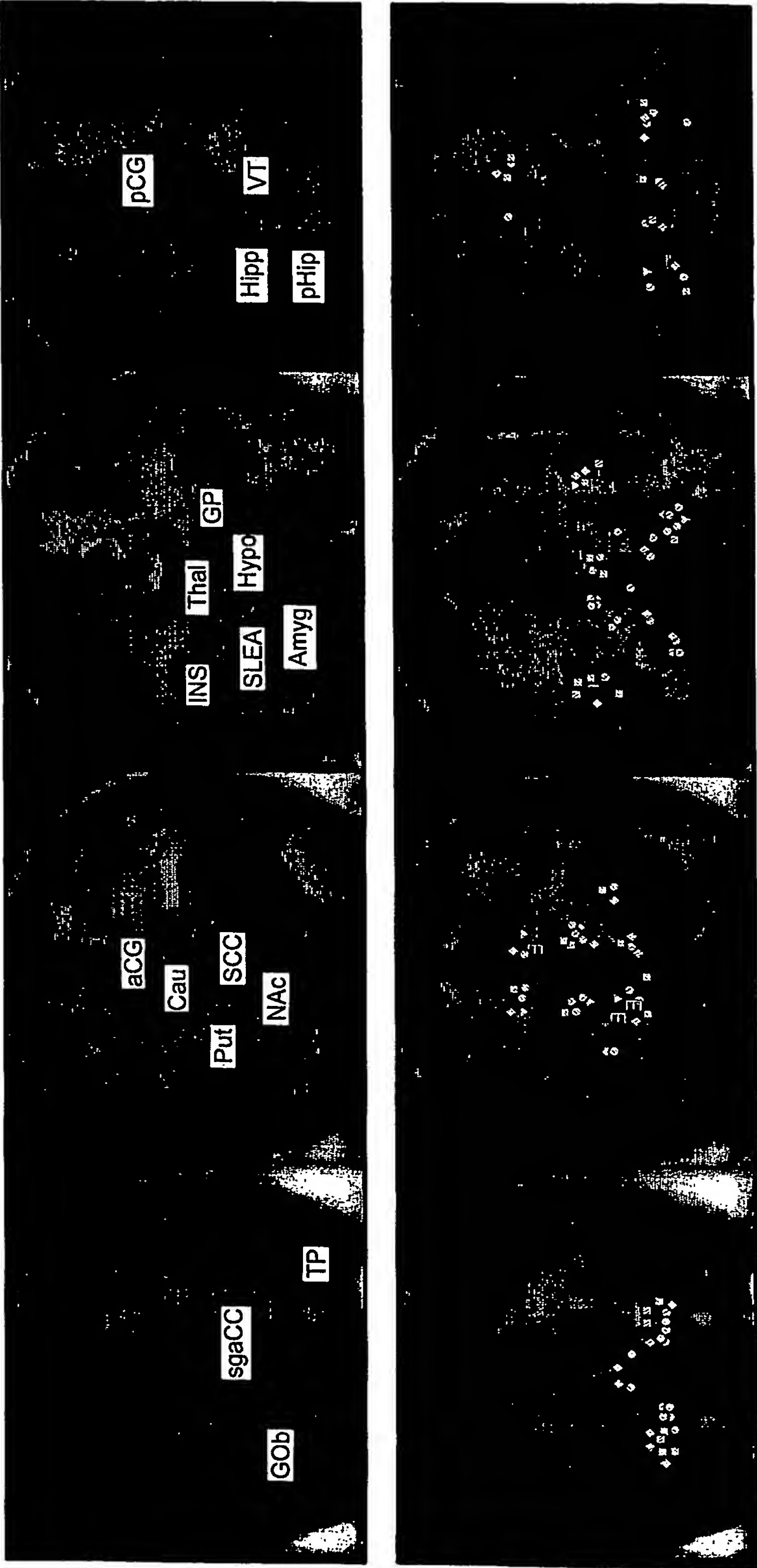
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Reward and Pain in aCG, INS, Thal

FIG. 10C

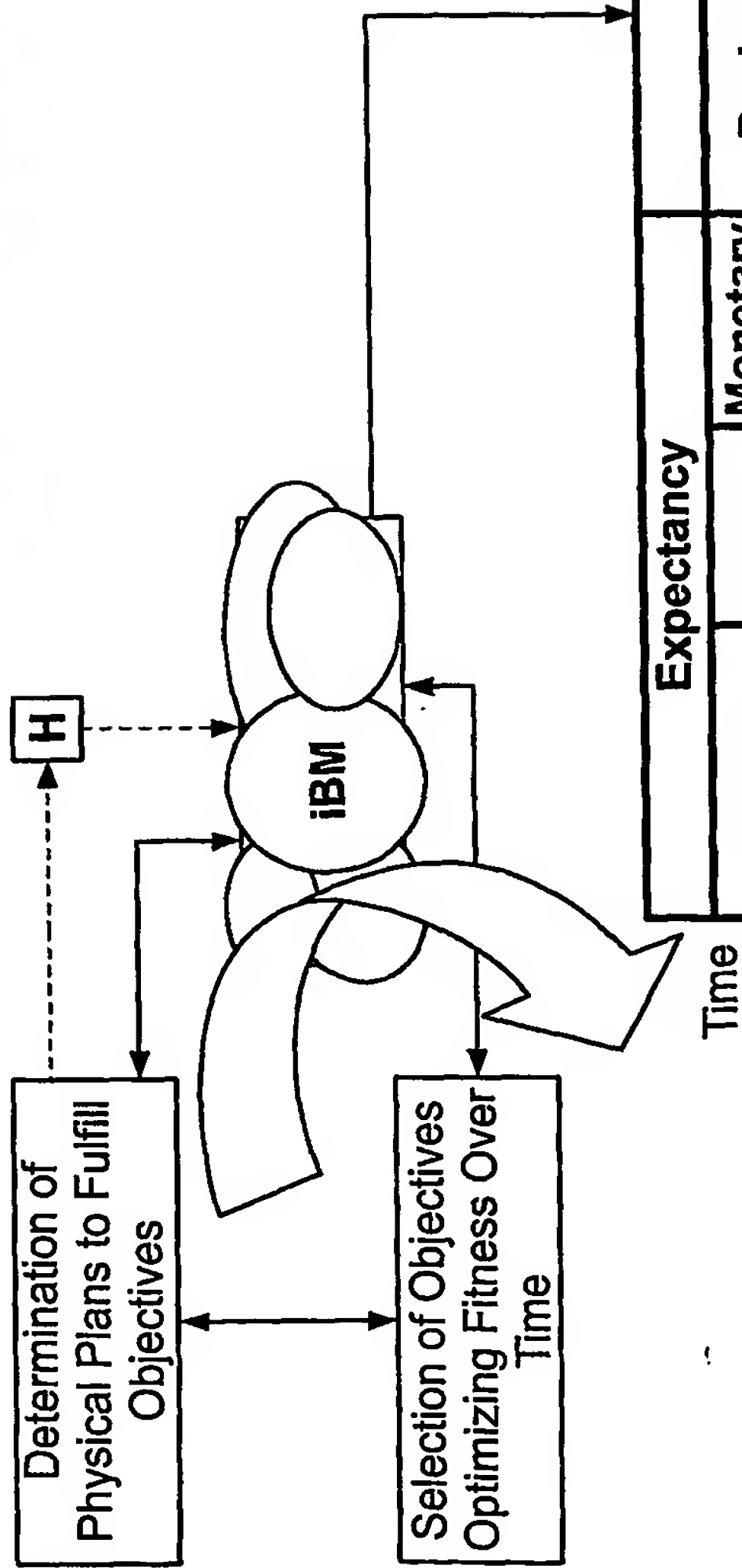
Consolidated Reward Studies in Healthy Subjects



<u>Monetary Reward</u>	<u>Appetitive Reward</u>	<u>Social-Aesthetic Reward</u>	<u>Drug Reward</u>	<u>Probability Paradigms</u>
<ul style="list-style-type: none"> ○ Guessing Paradigm ○ Performance Task ○ Prospect Theory Game 	<ul style="list-style-type: none"> ▣ Passive Fluid/Chocolate ▣ Passive Taste 	<ul style="list-style-type: none"> ◇ Passive Viewing Beauty ◇ Passive Viewing Loved Face ◇ Passive Listening Music 	<ul style="list-style-type: none"> ▽ Passive Inf Amphetamine ▽ Passive Inf Procaine 	<ul style="list-style-type: none"> ≡ Cognitive Tasks Focussed On Probability Assessment

FIG. 11

Systems Biology Map



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Expectancy			Outcomes				
Region	Cocaine	Monetary Reward	Region	Cocaine	Monetary Reward	Beauty	Pain
GOb	R		GOb	(1) X		(+) (X ²)	(+) (X ²)
	L	X ²		X	X ³		
NAC	R	X	NAC	X	X	X (X)	X
	L	X		X		X	X
SLEA	R	X	SLEA	(X) X	X	(X)	X
	L			X		X	
Amygdala	R		Amygdala	(X) X	X		(X)
	L	X		X	X	(X)	
VT	R		VT	X	X	(X)	X
	L			X			X

FIG. 12

**Circuit-Based Differences Allude
to Endophenotype Variations in Functional Illness**

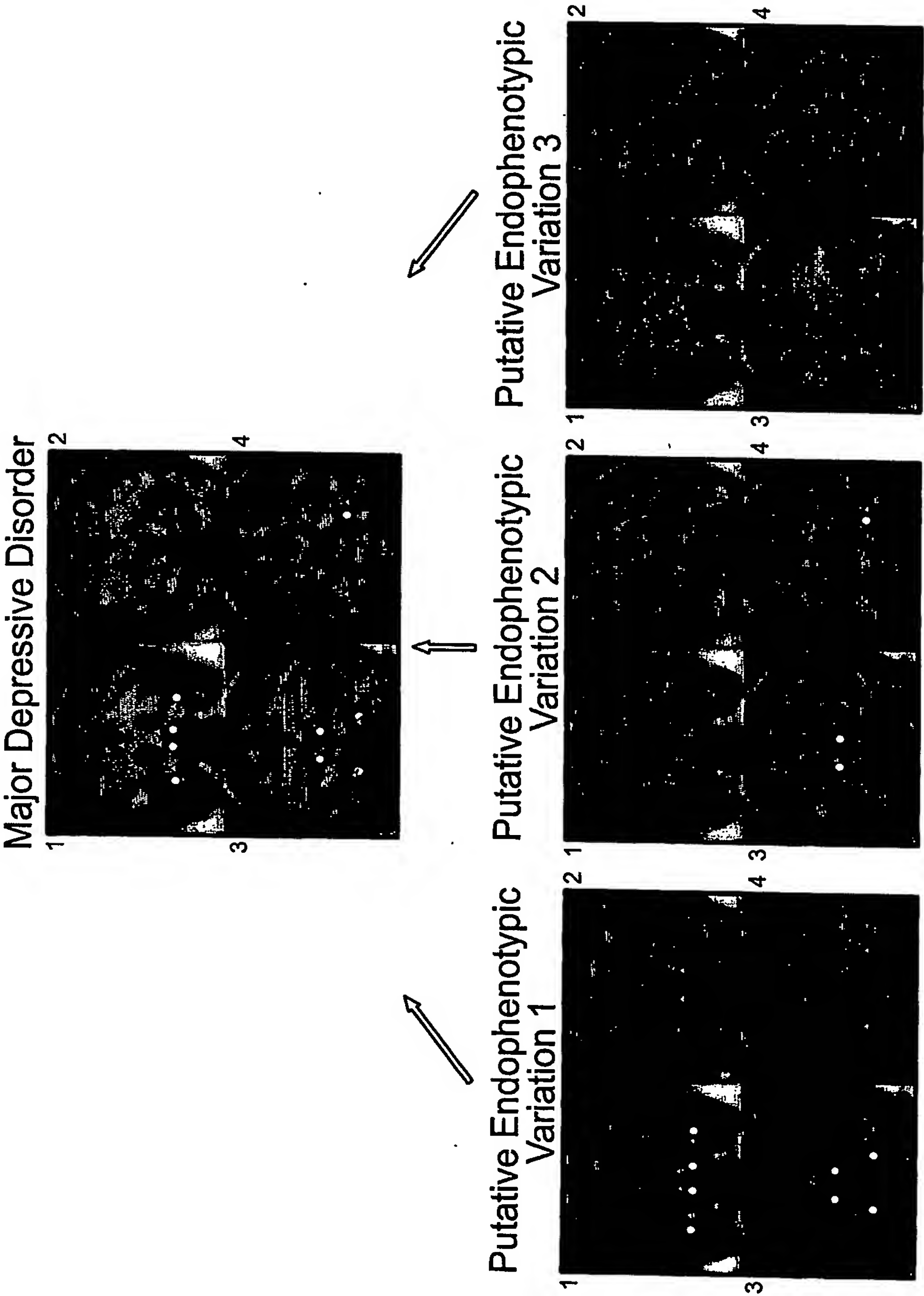
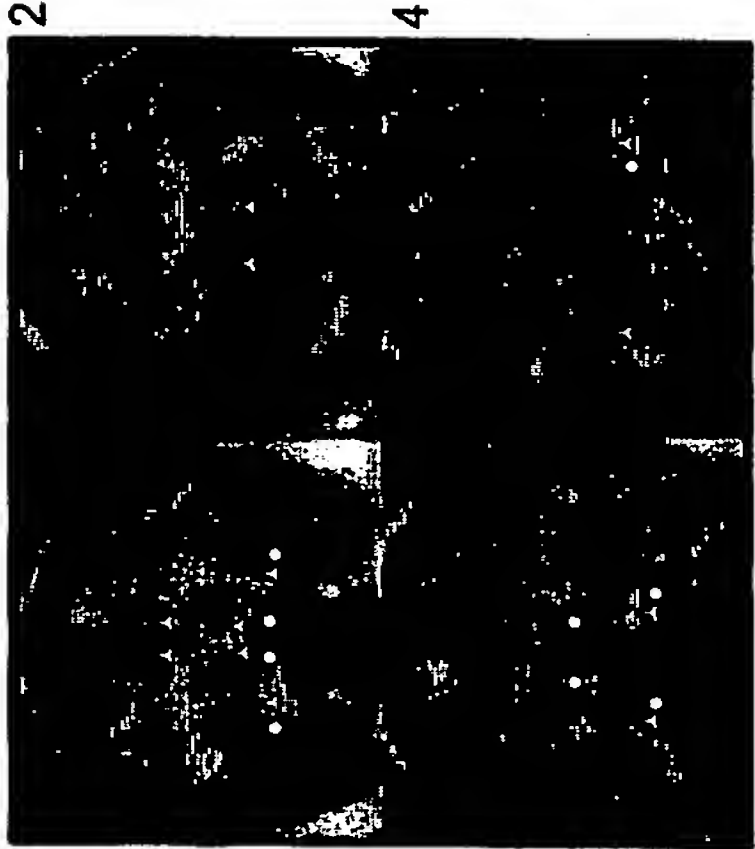


FIG. 13

Reward-Aversion Circuitry & Functional Illness

(2) Major Depressive Disorder

(1) Anxiety Disorders



(3) Addiction



(4) Behavioral Disorders (ex., OCD)



(5) Schizophrenia (Negative Sx)

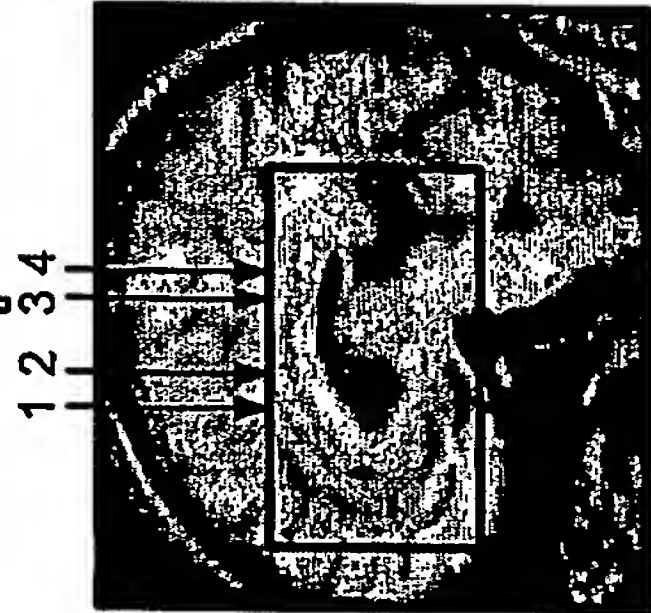
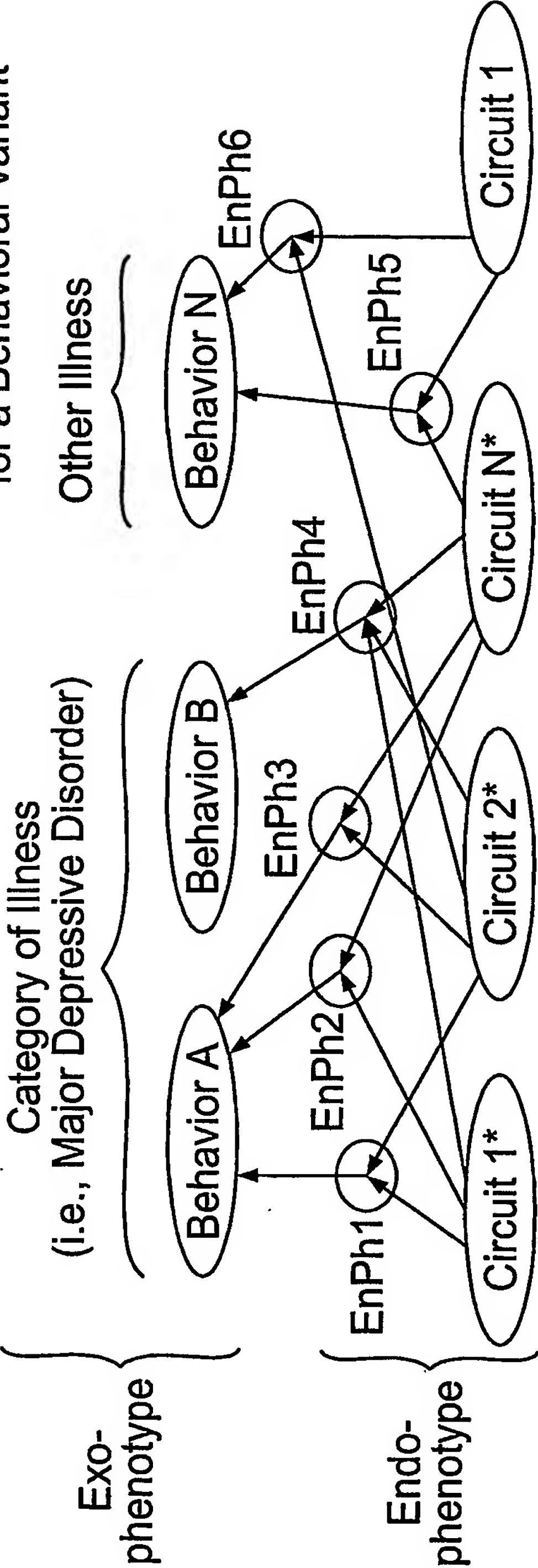


FIG. 14

Top-Down Approach (Phenotype to Genotype):

Potential to Identify All Polymorphic Traits and Temporal Adaptations for a Behavioral Variant



EnPh1 = Endophenotype 1
EnPh2 = Endophenotype 2
⋮
EnPh(N-1) = Endophenotype (N)

Metric Traits that Segregate with Illness Phenotype

EnPh(N+1) = Endophenotype (N+1)
EnPh(N+2) = Endophenotype (N+2)

No Clinical Manifestations

FIG. 15

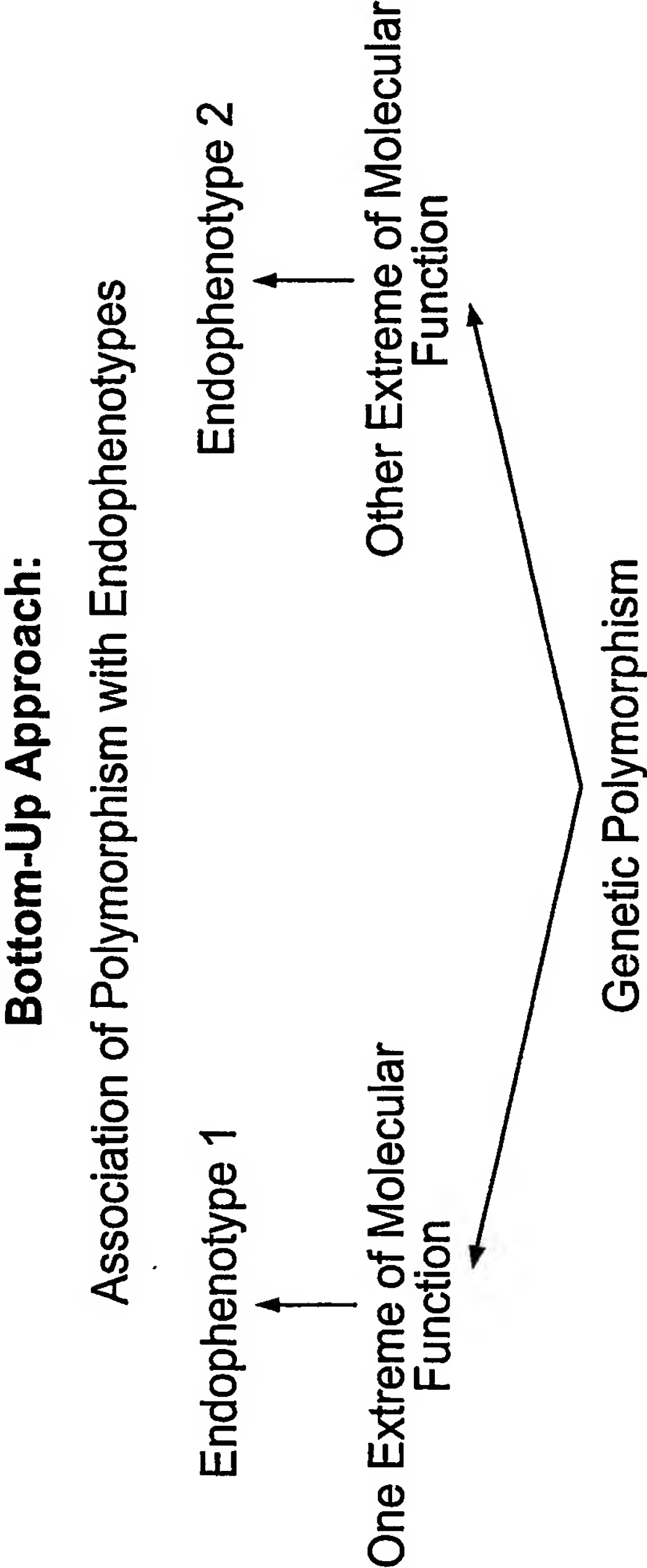


FIG. 16

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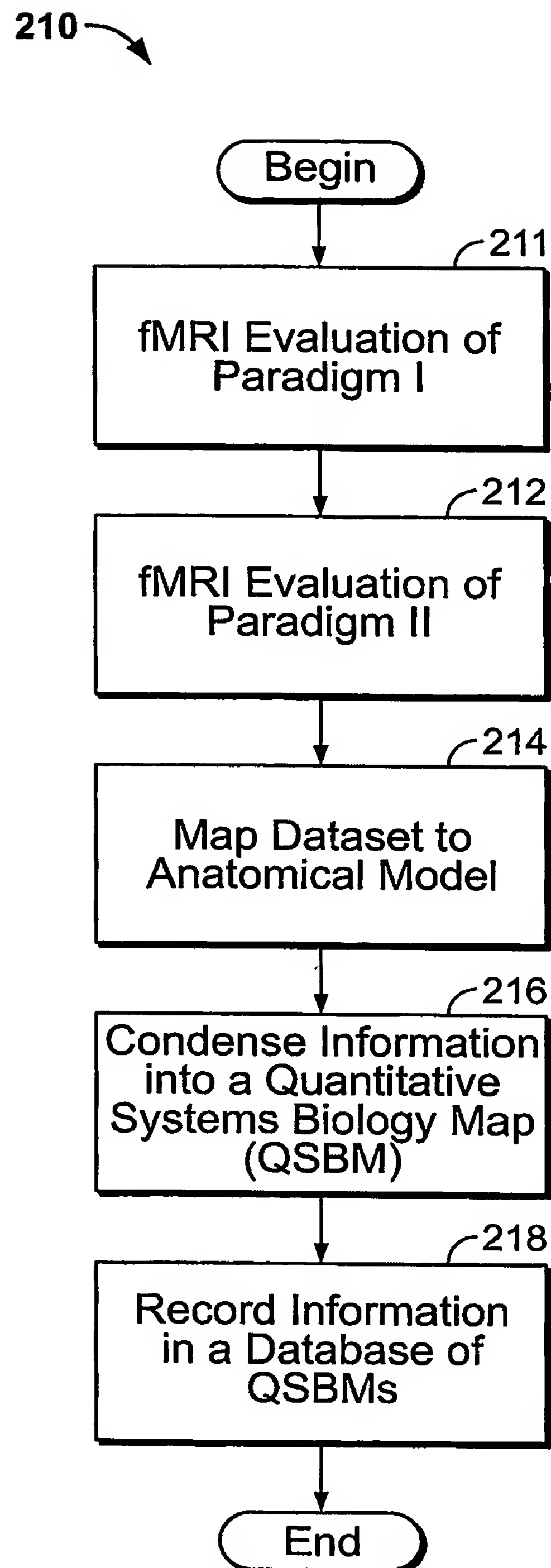


FIG. 17

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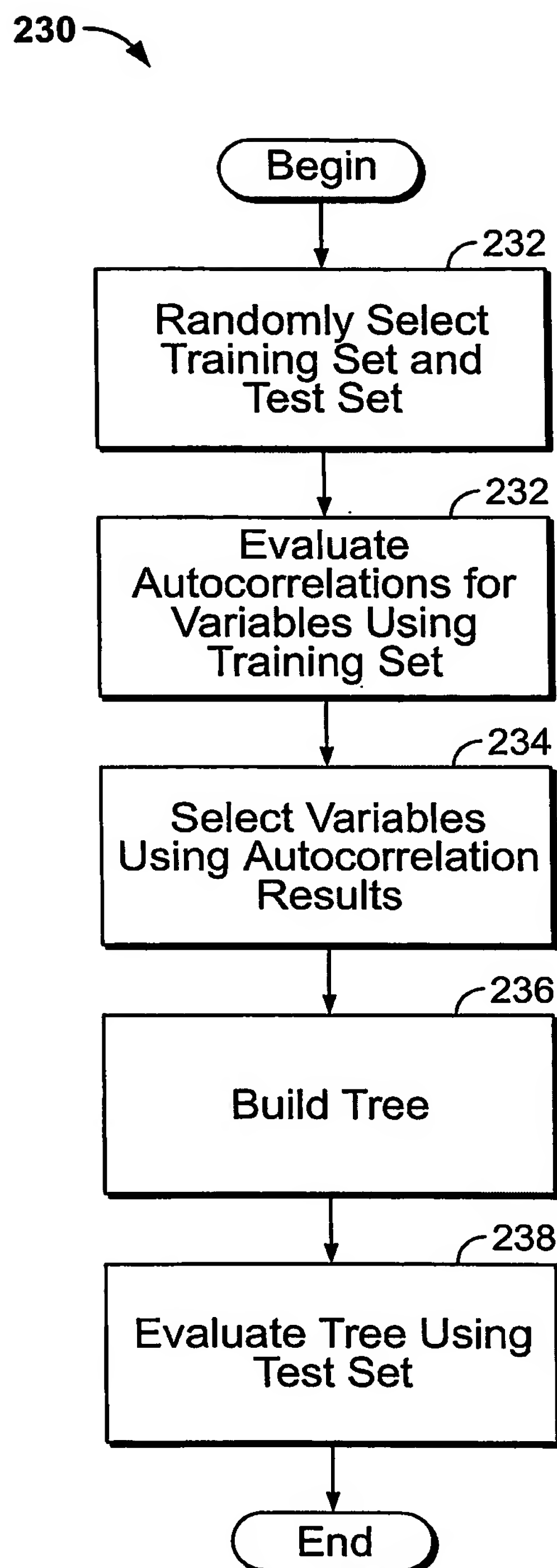


FIG. 18

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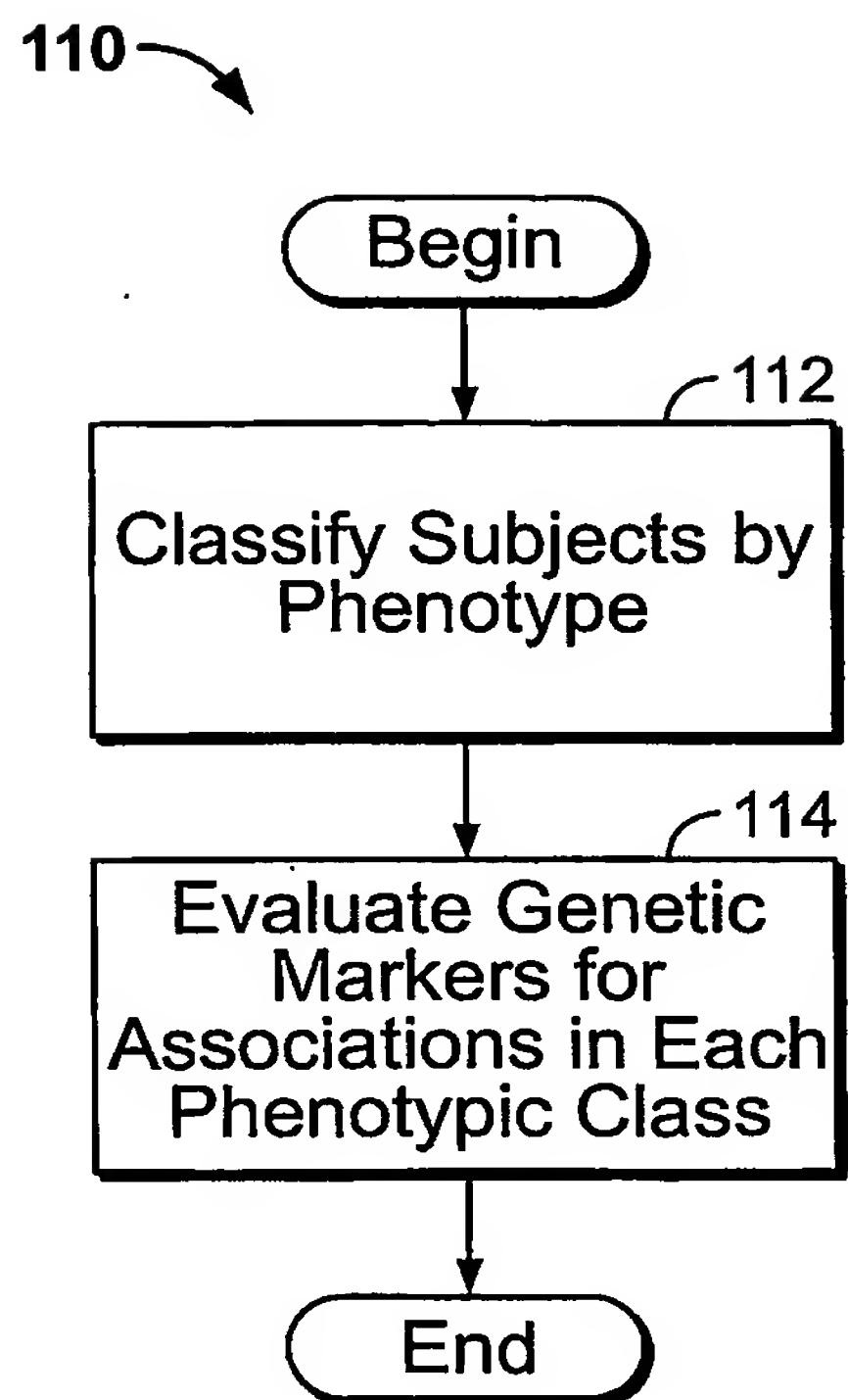


FIG. 19A

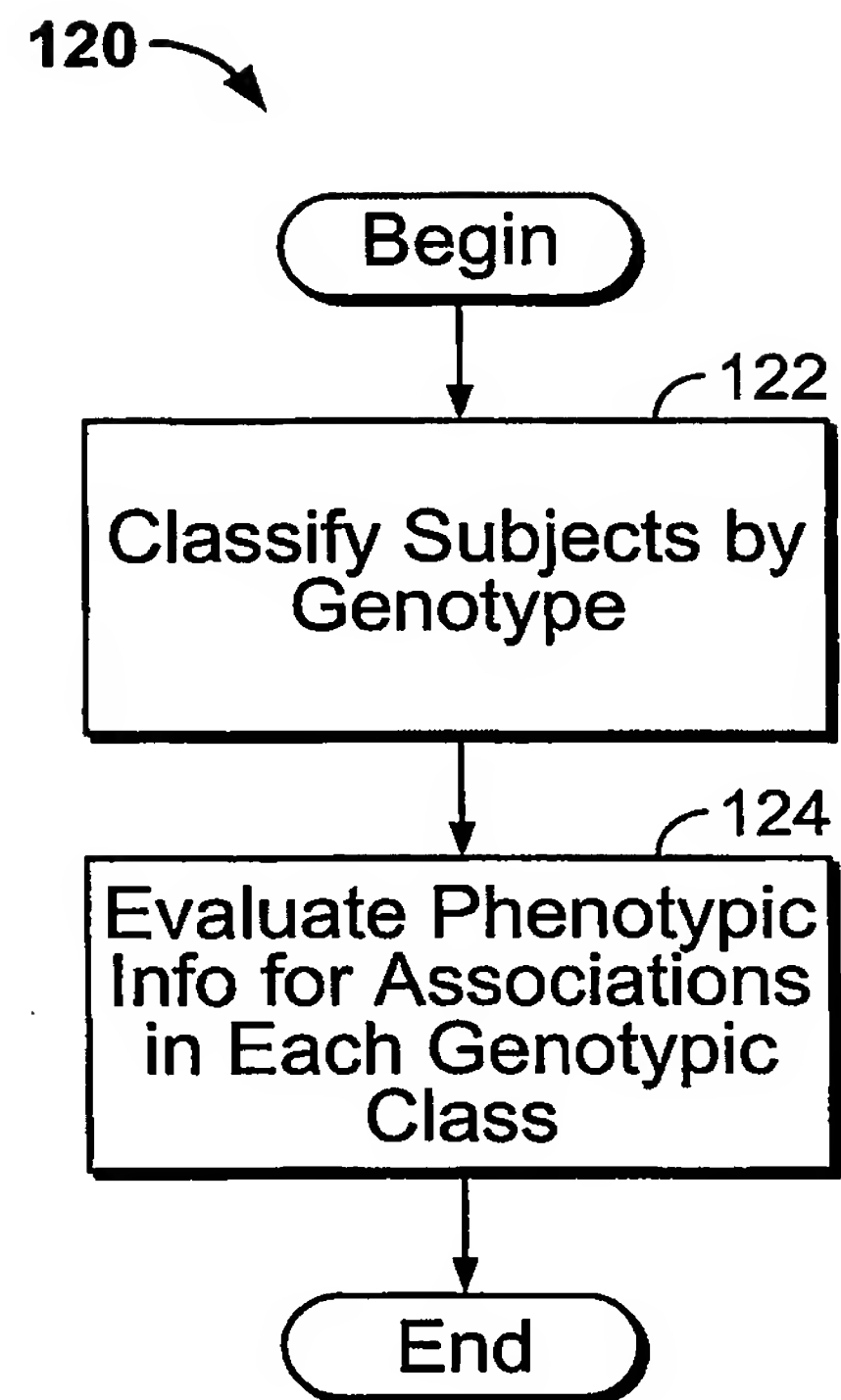


FIG. 19B

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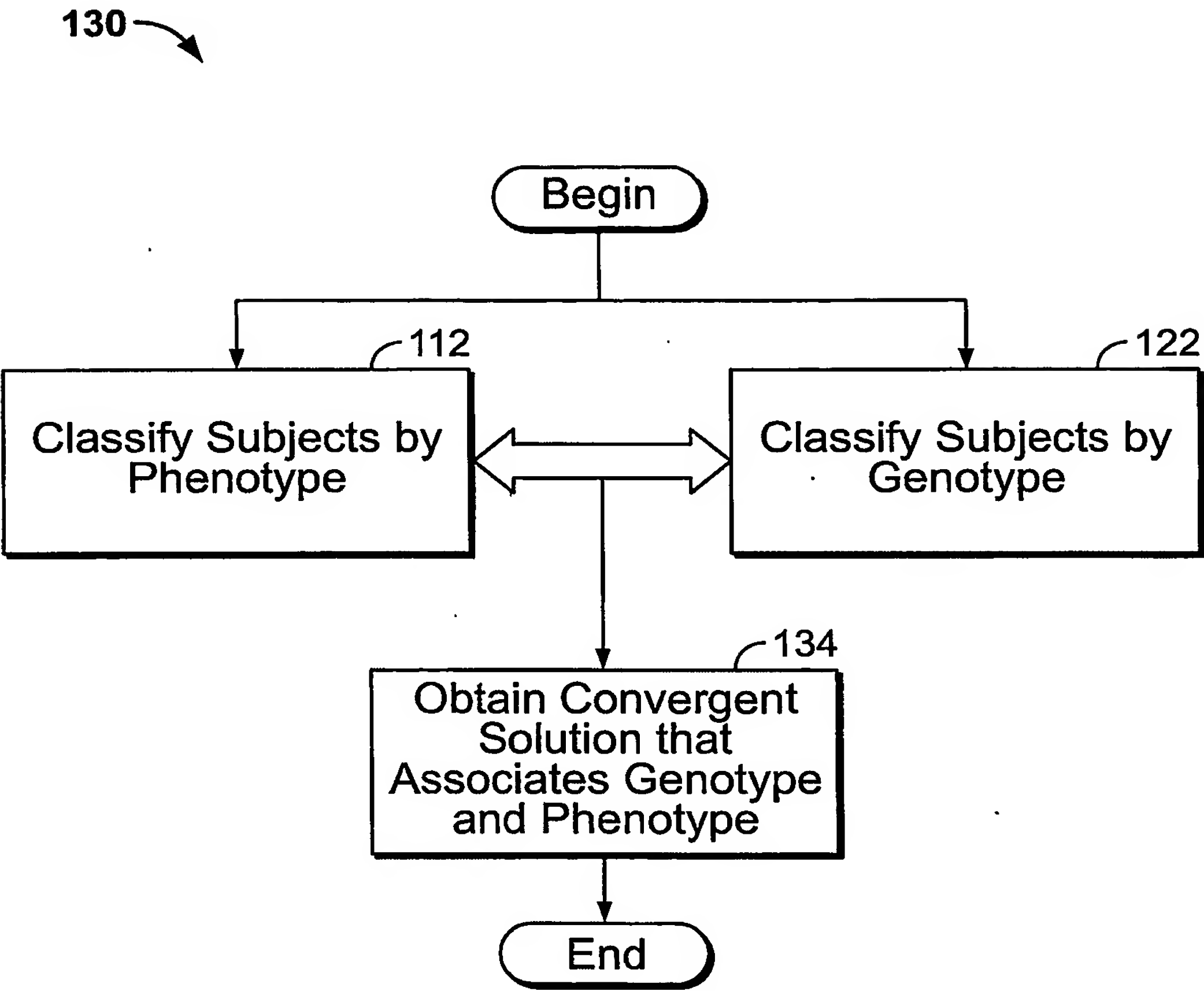


FIG. 19C

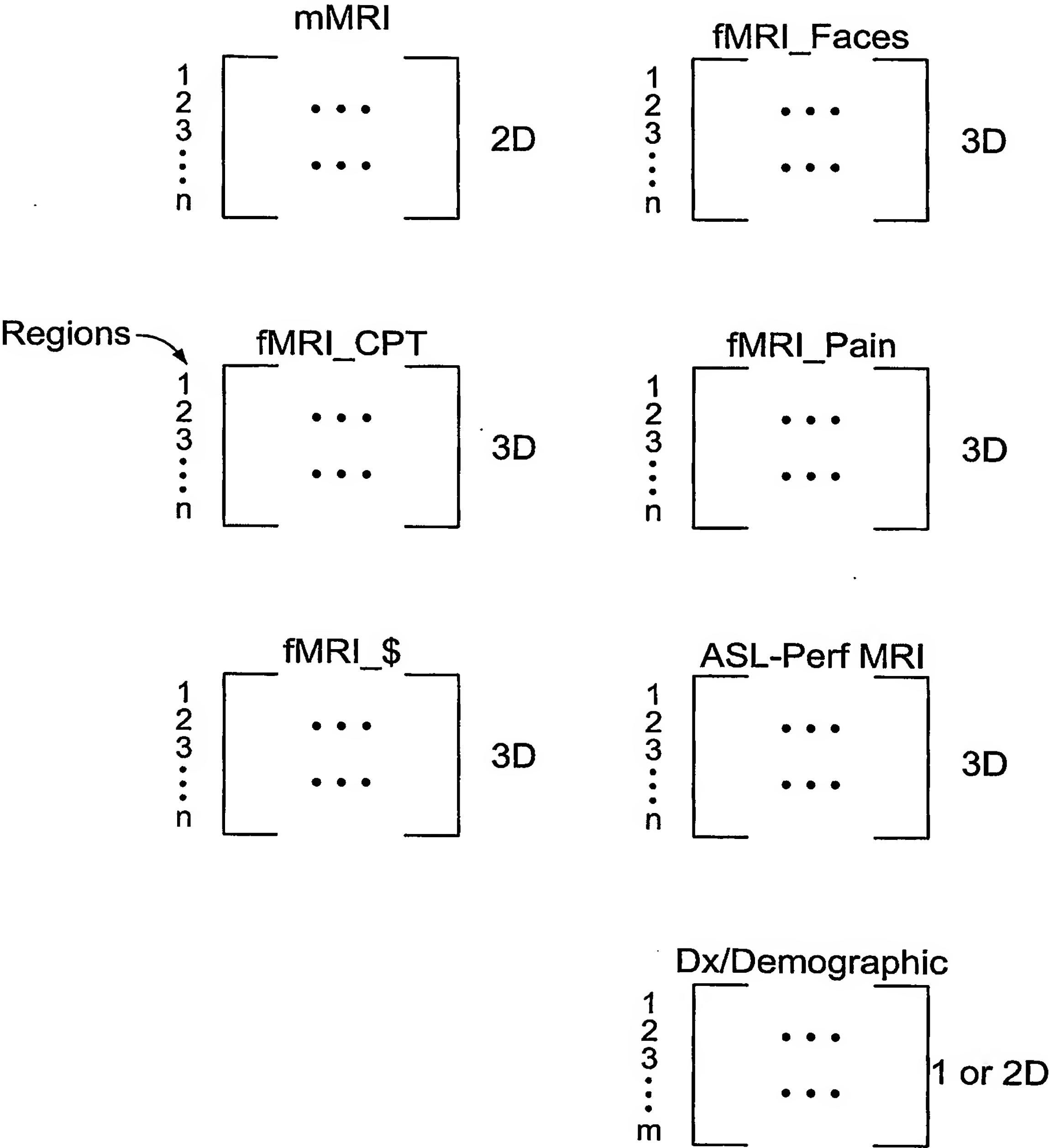


FIG. 20

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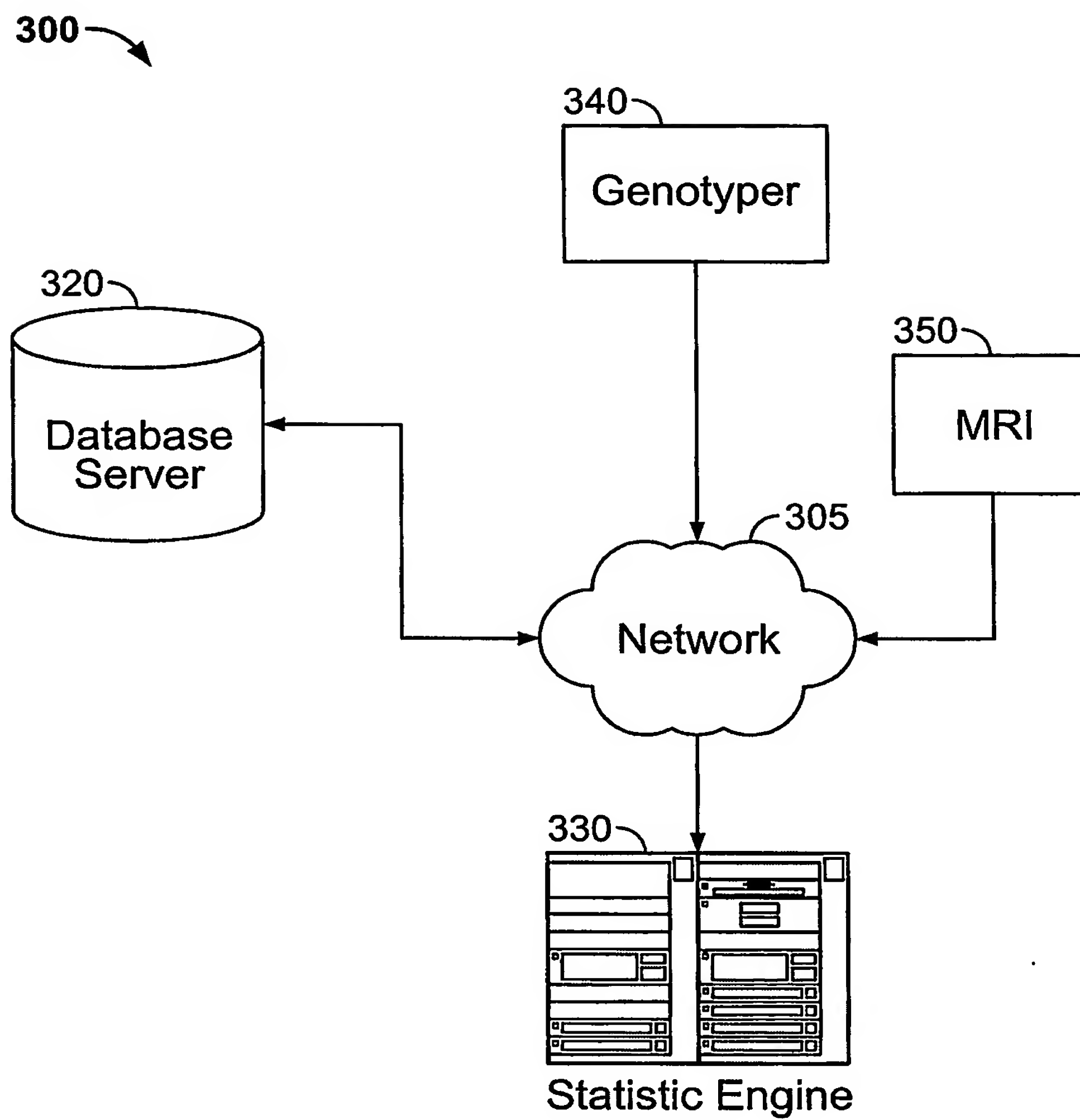


FIG. 21

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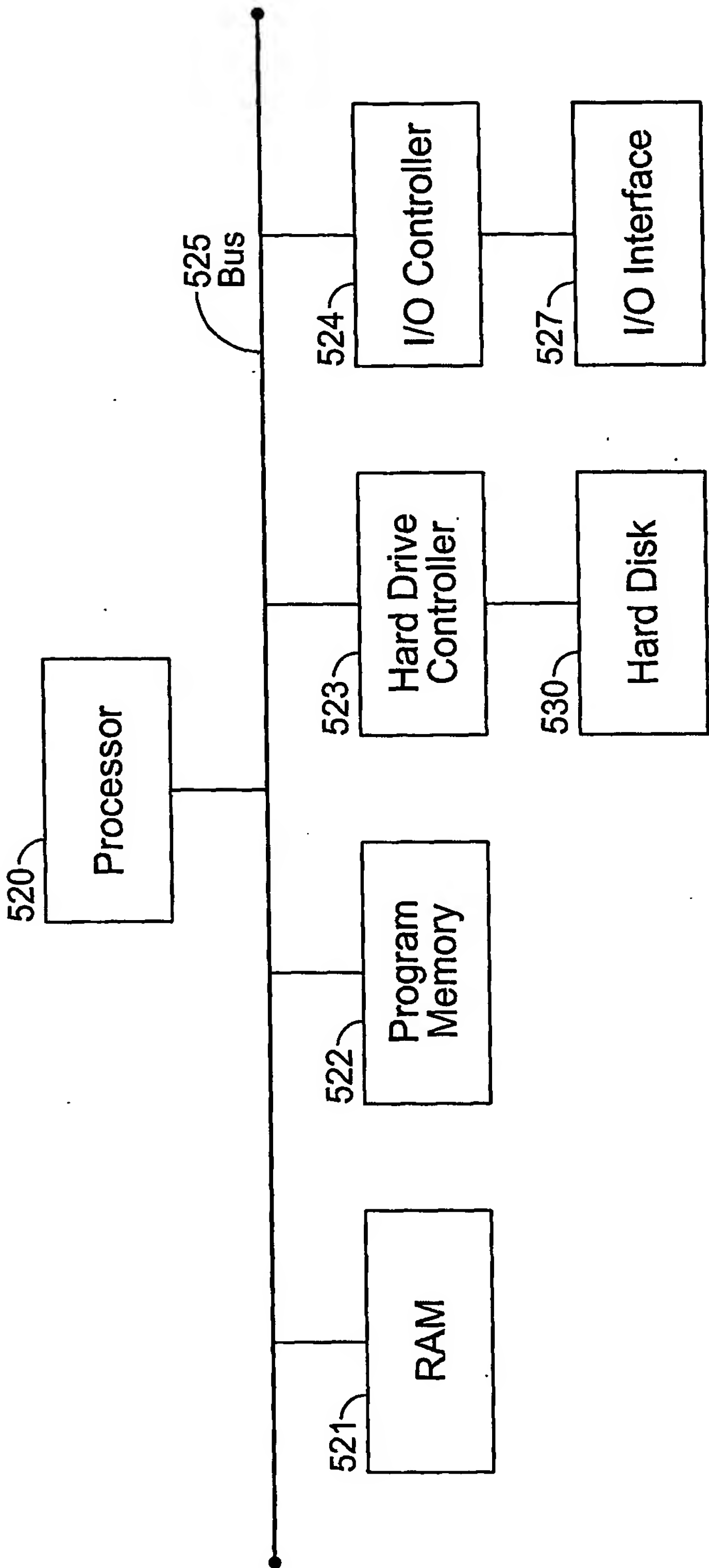


FIG. 22

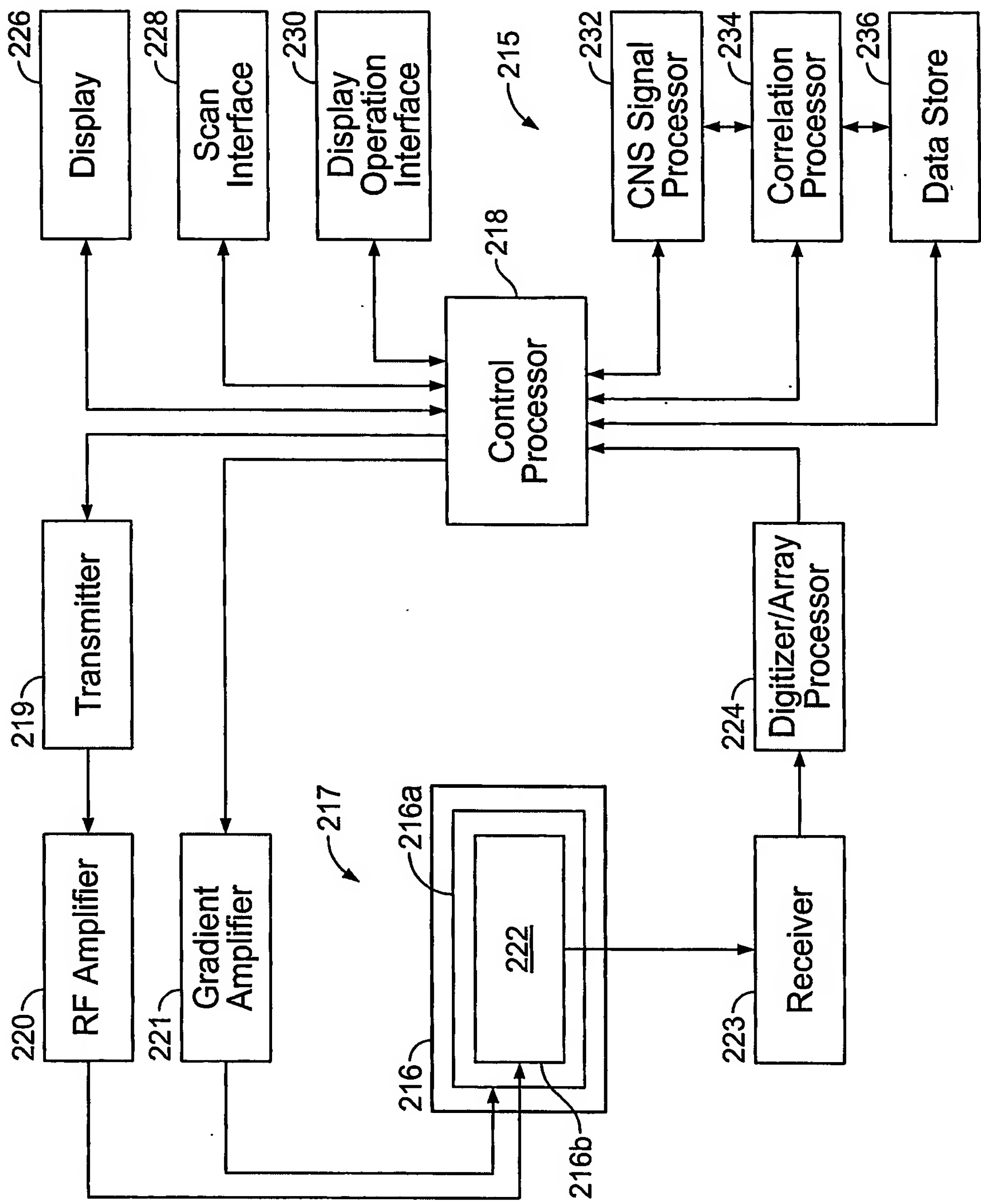


FIG. 23

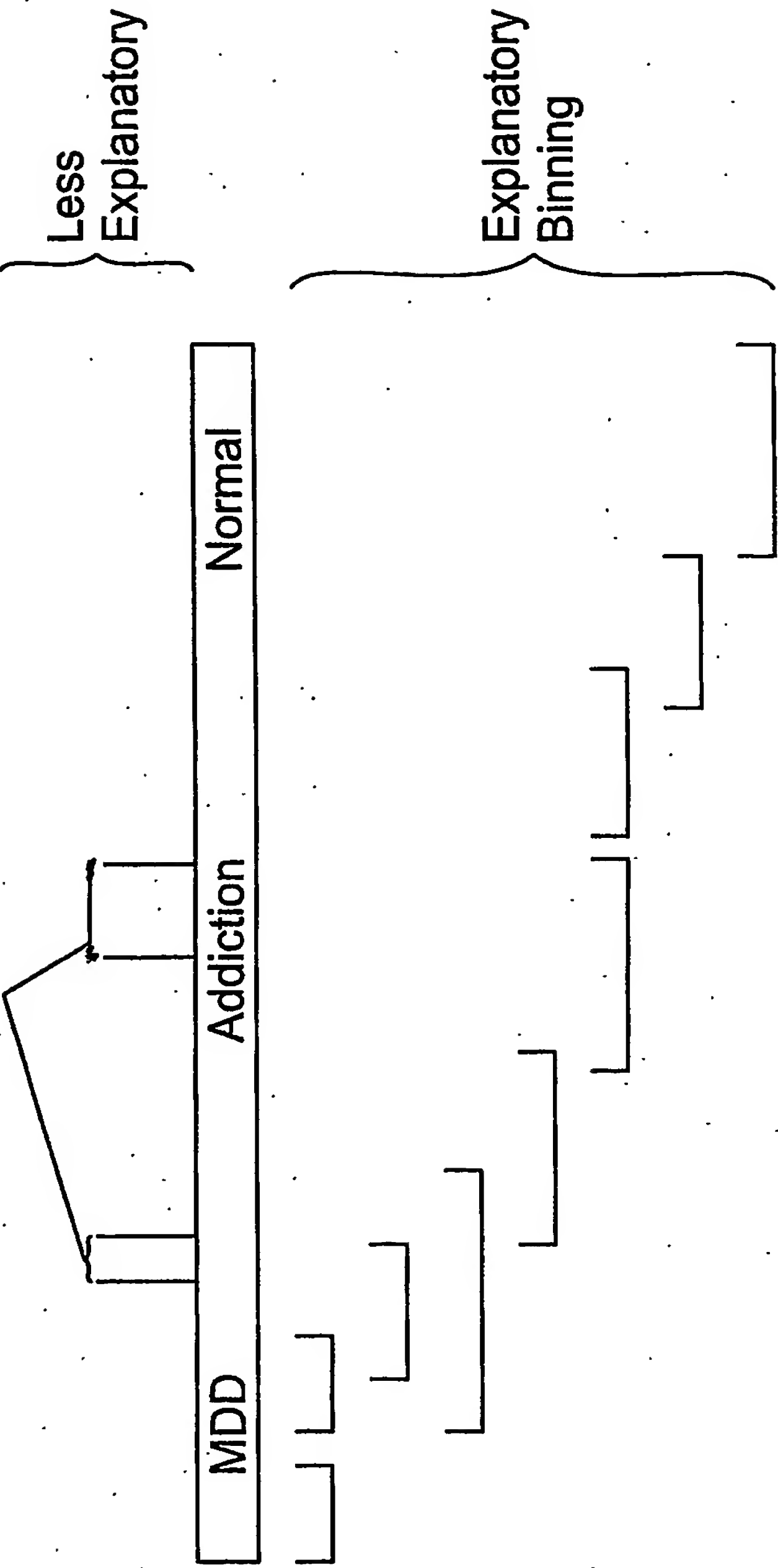


FIG. 24

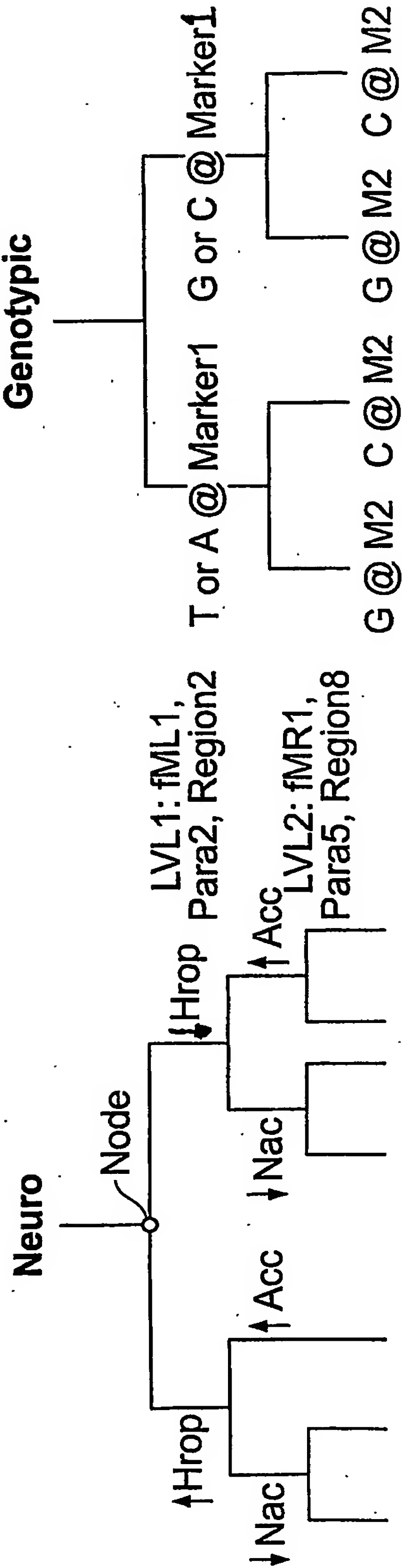


FIG. 25